SD11
A574
#211

United States
Department of
Agriculture

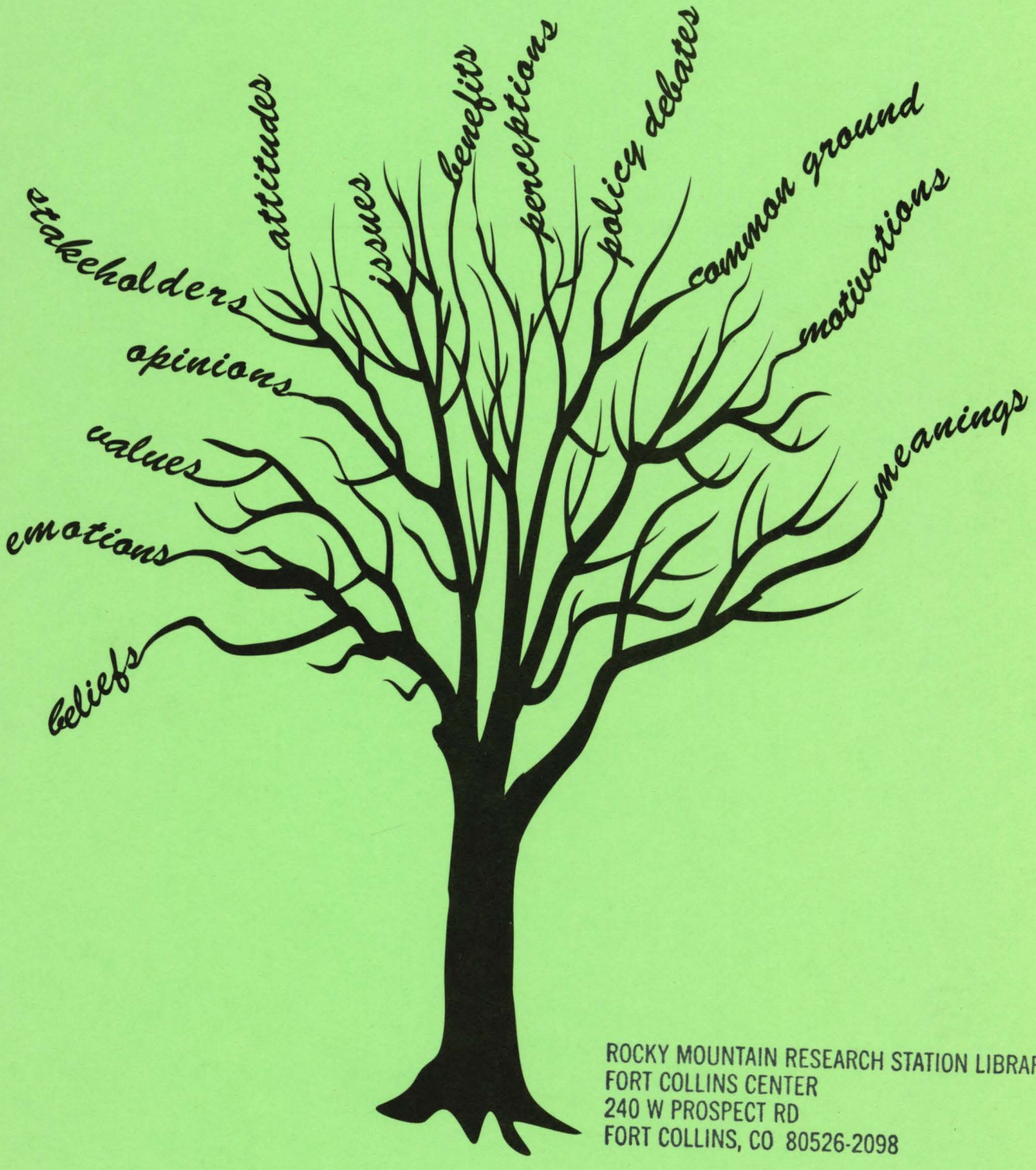
Forest
Service

North Central
Research
Station

General Technical
Report **NC - 211**

Applications of Computer - Aided Text Analysis in Natural Resources

Edited by: David N. Bengston



ROCKY MOUNTAIN RESEARCH STATION LIBRARY
FORT COLLINS CENTER
240 W PROSPECT RD
FORT COLLINS, CO 80526-2098

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410, or call 202-720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.

North Central Research Station
Forest Service—U.S. Department of Agriculture
1992 Folwell Avenue
St. Paul, Minnesota 55108
Manuscript approved for publication March 8, 2000
2000

Donald G. McTavish is a professor of Sociology at the University of Minnesota, Twin Cities, and is currently conducting research on workforce issues in the Bureau of Business and Economic Research, University of Minnesota, Duluth. With others, he is author of the Minnesota Contextual Content Analysis (MCCA) computer approach to the analysis of textual data. The program is available through web site www.clres.com along with related articles. MCCA has been used in a wide variety of studies over several years. Prof. McTavish organized one of the first regularly offered couses on computer content analysis as a methodological tool for social science research. He is co-author of texts on statistics and research methodology as well as a number of articles related to computer content analysis.

Karen G. Mumford is a doctoral candidate in the Conservation Biology Program at the University of Minnesota, Twin Cities, and a visiting assistant professor in the Department of Environmental Studies at Emory University in Atlanta, GA. She is collaborating with Prof. J. Baird Callicott to examine the relationship between ethics and values and changes in the biodiversity of the Great Lakes. Karen recently worked at the University of Iowa Center for Global and Regional Environmental Research where she conducted focus groups with farmers and farming-related interests to explore their views on greenhouse gas emissions and agriculture.

Chad D. Pierskalla is a doctoral candidate in the Department of Forest Resources at the University of Minnesota, Twin Cities. He received his M.S. in forestry from the College of Ecosystem Science and Management, Northern Arizona University, Flagstaff, and his B.S. in Recreation Resource Management at the University of Minnesota. Much of his research has supported recreation and resource planning projects. Chad's current interests include the examination and application of leisure events as a concept useful in recreation and resource planning.

Bonnie P. Riechert is coordinator of communications for The University of Tennessee Agricultural Experiment Station and an adjunct faculty member in the Department of Marketing, Logistics, and Transportation at The Unversity of Tennessee. Her research areas include political communication, environmental communication, and the role of issue framing in publlic opinion and policymaking.

Herbert W. Schroeder is a psychologist working with the USDA Forest Service, North Central Research Station, in Evanston, IL. He has used both quantitative and qualitative methodologies to study environmental preferences and the meanings associated with natural settings. His research includes such topics as people's perceptions of the aesthetic quality and safety of forest recreation sites; the experiential, symbolic, and spiritual aspects of natural environments; and the feelings of attachment that people have for "special places" in nature.

James Shanahan is an assistant professor in the Department of Communication at Cornell University. His specialty is environmental communication, with a focus on mass media issues. Prof. Shanahan has conducted research on media impacts on environmental beliefs, including beliefs about wildlife and global warming. His books include *Nature Stories* (Hampton Press 1999) and *Television and its Viewers* (Cambridge University Press 1999).

Lynne M. Westphal is a research social scientist with the USDA Forest Service, North Central Research Station in Evanston, IL. Her general research interests focus on the effects of nature on people in cities and towns. Two recent projects include assessments of empowerment outcomes from urban greening projects and the public's perceptions, uses, and development ideas for the Chicago River corridor. She is the co-editor of *People and the River: Perception and Use of Chicago Waterways for Recreation*, a 1998 publication of the Chicago Rivers Demonstration Project.

Applications of Computer-Aided Text Analysis in Natural Resources

David N. Bengston
Technical Editor

ABOUT THE AUTHORS

Stewart D. Allen is a social scientist with the Division of Refuges, U.S. Fish and Wildlife Service, Anchorage, AK. He serves as in-house consultant on social issues facing Alaska's national wildlife refuges and as a member of the planning team revising refuge comprehensive conservation plans. When this study was conducted, he was a research social scientist with the USDA Forest Service, Pacific Northwest Research Station, Social and Economic Values Program, stationed in Juneau, AK.

Terilyn D. Allendorf recently completed her Ph.D. in the Conservation Biology Program at the University of Minnesota, Twin Cities. She has worked as a Peace Corps volunteer in Nepal and is currently working at the Institute for Social, Economic and Ecological Sustainability and the Conservation Biology Graduate Program at the University of Minnesota. Her research interests include non-utilitarian values toward protected areas, their role in forming sustainable relationships between residents and protected areas, and the use of cognitive mapping to understand people's perceptions of the environment.

Dorothy H. Anderson is a professor in the Department of Forest Resources at the University of Minnesota, Twin Cities. Her research focuses on assessing visitor-caused impacts to resources and visitor experiences, developing and testing management models for recreation resource management (e.g., benefits-based management), and extending benefits-based management to larger landscapes.

David N. Bengston is a research social scientist with the USDA Forest Service, North Central Research Station, St. Paul, and an adjunct professor in the College of Natural Resources at the University of Minnesota, Twin Cities. His research focuses on environmental attitudes, beliefs, and values, and the human dimensions of ecosystem management.

J. Baird Callicott is a professor in the Department of Philosophy and Religion Studies at the University of North Texas, Denton. Dr. Callicott is a founding member of the field of environmental ethics. He has authored numerous seminal works including *In Defense of the Land Ethic: Essays in Environmental Philosophy* (1989), *Earth's Insights: A Multicultural Survey of Ecological Ethics from the Mediterranean Basin to the Australian Outback* (1994), and *Beyond the Land Ethic: More Essays in Environmental Philosophy* (1998). Dr. Callicott has edited or co-edited several books including *Companion to A Sand County Almanac: Interpretive and Critical Essays* (1987) and *The Great New Wilderness Debate* (1997).

Jennifer A. Cuff recently completed a bachelor of music degree in vocal and general music education at the University of Minnesota, Twin Cities. Her involvement with the research project summarized in this volume was through the University's Undergraduate Research Opportunity Program (UROP). Ms. Cuff has worked as a park ranger for the National Park Service for three summer terms at Jewel Cave National Monument in the Black Hills of South Dakota, and as a park ranger river educator at the Mississippi National River and Recreation Area in St. Paul, MN.

David P. Fan is a professor in the Department of Genetics and Cell Biology at the University of Minnesota, Twin Cities, and president of InfoTrend, Inc., St. Paul. His research focuses on predictions of public opinion from the press using computer content analysis. He is the creator of the InfoTrend method of computer content analysis and author of the book *Predictions of Public Opinion from the Mass Media: Computer Content Analysis and Mathematical Modeling* (1988).

TABLE OF CONTENTS

Page

Foreword I
David N. Bengston

Increasing the Trustworthiness of Research Results: The Role of Computers in Qualitative Text Analysis 1
Lynne M. Westphal

What Makes A Place Special? Interpretation of Written Survey Responses in Natural Resource Planning 7
Herbert W. Schroeder

Exploring Residents' Perceptions of a Natural Protected Area Using Computer-Aided Analysis of Interview Text 12
Terilyn D. Allendorf

Turning Qualitative Text Into Interval-level Data: A Computer Content Analysis Approach 15
Chad D. Pierskalla and Dorothy H. Anderson

Exploring the National Benefits of Alaska's Tongass National Forest 19
Stewart D. Allen, David N. Bengston, and David P. Fan

Applying the VBPro Computer Programs to Analysis of Environmental Policy Debates: Comparing Stakeholder Frames 26
Bonnie P. Riechert

Messages in Global Climate Change: Using the Diction Program to Analyze News Coverage 29
James Shanahan

Monitoring the Social Environment for Forest Policy Using the InfoTrend Computer Content Analysis Method 34
David N. Bengston and David P. Fan

Computer-Aided Qualitative Content Analysis: A Useful Approach for the Study of Values 43
Karen G. Mumford and J. Baird Callicott

In Search of Common Ground Among Diverse Forest Stakeholders: A Contextual Content Analysis of Online Text 48
Jennifer A. Cuff, David N. Bengston, and Donald G. McTavish

FOREWORD

David N. Bengston

Textual analysis has a long, even ancient, intellectual lineage. For example, hermeneutics is a branch of scholarship that deals with the theory and practice of interpretation of written texts. Hermeneutic analysis originally focused on meanings in sacred texts but has broadened in the past century or so to include texts of all types. Historical analysis is another type of qualitative textual analysis with its own set of assumptions and techniques. The term *content analysis* dates back at least to the early 1930's, but the systematic, quantitative analysis of printed material dates back to studies carried out by theologians in the late 1600's when the Church was concerned about the spread of nonreligious ideas through newspapers (Krippendorff 1980).

During the 1930's through the 1950's, qualitative and quantitative approaches to text analysis spread to a wide range of disciplines. Pool's (1959) book *Trends in Content Analysis* included contributions from psychology, political science, literature, history, anthropology, and linguistics. By the late 1950's and early 1960's, computers had begun to be applied to text analysis, opening up new opportunities for both qualitative and quantitative analysis. The use of computer-aided approaches to analysis of textual data has increased dramatically in recent years with the development of a wide range of text analysis computer programs.

The papers included in this volume are part of this long and growing tradition of text analysis, and they are evidence of the increasing use of computer-aided text analysis to examine a wide range of questions related to natural resources and the environment. Growing interest in this type of analysis is likely due to several factors. Computer-aided text analysis can handle large volumes of data, such as news media text, which is increasingly available from online sources. It can be used to analyze unstructured material, such as open-ended questionnaires or interviews, which has the advantage of not constraining respondents to a predefined set of choices. Depending on the source of the data, computer-aided text analysis may also be an unobtrusive and nonreactive research technique. For example, in the case of news media text or stakeholder documents, neither the sender nor the receiver of messages contained in the text is aware that the messages are being analyzed. This eliminates the possibility that the act of measurement itself will influence the data, a common problem in social science research.

Ten papers are included in this volume, and they represent a cross section of computer-aided text analysis research currently being done by social scientists working in natural resources. The disciplinary backgrounds of the authors include environmental psychology, environmental philosophy, sociology, conservation biology, journalism, mass communications, planning and policy analysis, genetics, economics, and recreation research. This diverse group of researchers have used a wide range of computer methods in the papers contained in this volume, including the following:[1]

- **InfoTrend.** The InfoTrend software and methodology was developed by Prof. David Fan at the University of Minnesota. This method has been used to successfully predict public opinion based on analysis of news media text on a wide range of topics. The InfoTrend software allows the analyst to develop customized *dictionaries* (a list of ideas important for the topic and a list of groups of words and phrases associated with each idea) and *idea transition rules* (which specify how pairs of ideas contained in the dictionaries are combined to give new meanings) to track ideas and issues of interest over time.

- **Minnesota Contextual Content Analysis (MCCA).** MCCA, developed by Prof. Donald McTavish and colleagues at the University of Minnesota, has been used in many social science investigations to systematically score open-ended textual

[1] *Discussion of these computer programs does not imply an endorsement by the USDA Forest Service.*

information. This program characterizes social meanings and themes in any text by computing four social *context scores* (which reflect the relative emphasis on traditional, practical, emotional, and analytic perspectives in the text) and 116 *emphasis scores* (which measure the overemphasis or underemphasis of themes in the text compared to standard English usage). MCCA is available in its PC version at: www.clres.com.

- **DICTION 4.0.** DICTION, developed by Prof. Roderick P. Hart at the University of Texas, Austin, is similar in some respects to MCCA, including the fact that it is a revised version of an earlier mainframe-based program. A key difference is that MCCA's concept dictionaries are psychological in nature and DICTION's are political. DICTION analyzes the tone of text, including 5 general themes or conceptual categories (certainty, activity, optimism, realism, and commonality) and 35 subcategories. A demonstration version of DICTION may be downloaded at: www.sagepub.com/sagepage/diction.htm.

- **QSR NUD•IST 4.** NUD•IST (which stands for Non-numerical, Unstructured Data; Indexing, Sorting, and Theorizing) is a widely used software program—with more than 10,000 licensed users worldwide—developed by Lyn and Tom Richards, then of La Trobe University in Bundoora, Australia, and now with Qualitative Solutions and Research Pty. Ltd. (QSR). This multifunctional software system can be used to analyze documents of all types, allowing the researcher to code and search text, construct and test theories, etc. A demonstration version and tutorial can be downloaded at: www.qsr.com.au.

- **VBPro.** VBPro is a family of DOS-based computer programs developed by Prof. M. Mark Miller at The University of Tennessee, Knoxville. The VBPro programs can produce files of key terms in context, create lists of words in a file along with their frequency in alphabetical order or by descending order of frequency, and code various text units (e.g., sentences, paragraphs) for frequency or presence/absence of categories of selected words or phrases. A Concept Mapping function provides visual representation of the relative location of terms and phrases in text, and Frame Mapping (an application of Concept Mapping) enables the analyst to specify, measure, and compare issues by different sources in text. The VBPro programs and their user guides are available free and may be downloaded at: excellent.com.utk.edu/~mmmiller/vbpro.html.

The authors of papers in this volume applied these (and other) computer methods to address a wide range of research questions using textual data from a variety of sources. The first four papers analyzed text obtained from interviews or surveys focusing on the values and perceptions associated with particular places. Lynne Westphal examines the critical issue of trustworthiness (validity and reliability) in qualitative text analysis and discusses how NUD•IST can be used to increase trustworthiness, using examples from her research on neighborhood change brought about through urban greening projects. Data for her analysis were obtained from open-ended interviews of neighborhood residents, supplemented by and compared with closed-ended interview questions. Herb Schroeder used a set of indexing and cross-referencing macros that he wrote in Word Perfect to analyze written, open-ended survey responses from residents and visitors of the Black River area in northern Michigan. The focus of his analysis was on identifying the meanings and values that people attach to special places, and the implications of place attachment for management. Teri Allendorf used NUD•IST to facilitate the analysis of interview transcripts of residents of Royal Bardia National Park in Nepal. She developed a coding strategy to classify the positive and negative attributes that residents associate with the park and explored relationships among attributes. Chad Pierskalla and Dorothy Anderson also analyzed interview transcripts, using the MCCA program to code interviews of visitors to Isle Royale National Park in Michigan. They discuss the methodology, selected findings, and advantages and disadvantages of this approach to computer-coded content analysis.

The next four papers all analyzed news media text. Stewart Allen and co-authors David Bengston and David Fan used the InfoTrend software to analyze the benefits and values expressed in news media stories about the Tongass National Forest in Alaska over the period January 1985 through July 1997. Bonnie Reichert used VBPro to analyze news stories and news releases from stakeholder groups about the issues of wetlands and of timber salvage on the U.S. national forests. Shifts and changes in news media reports about global climate change over the period 1988 through 1997 were analyzed by James Shanahan using DICTION. Shanahan demonstrates how computer-coded content analysis can be used in conjunction with human-coded content analysis to faciliate triangulation of findings. Finally, Bengston and Fan describe a system for monitoring the social environment using the InfoTrend method. They illustrate this monitoring system with selected trends related to the Forest Service and national forests.

Published documents produced by natural resource stakeholders are the data source for the final two papers. Karen Mumford and Baird Callicott used NUD•IST to facilitate the analysis of documents produced by Great Lakes nongovernmental organizations. They discuss the methodology they developed to study stakeholder values, examine the usefulness of this approach, and present selected findings. Finally, Jennifer Cuff, David Bengston, and Donald McTavish used MCCA to examine differences and similarities in a diverse set of seven forest stakeholder groups, ranging from radical environmentalists to forest industry associations.

Taken together, these papers paint a picture of a growing and vital area of research on the human dimensions of natural resources and the environment. Computer-aided text analysis is a powerful new set of tools that enable social scientists to explore in depth and detail the many attitudes, beliefs, values, motivations, and meanings related to natural resource issues. The methods discussed in this volume are not a substitute for traditional social science research methods; rather, they are valuable new approaches that complement traditional methods. As computer methods become more powerful and gain greater acceptance among social scientists and policymakers, computer-aided text analysis will likely continue to be used more widely and productively to explore the nuances of human-environment interactions.

LITERATURE CITED

Krippendorff, Klaus. 1980. **Content analysis: an introduction to its methodology.** Newbury Park, CA: Sage Publications.

Pool, I. de Sola. 1959. **Trends in content analysis**. Urbana, IL: University of Illinois Press.

Increasing the Trustworthiness of Research Results: The Role of Computers in Qualitative Text Analysis

Lynne M. Westphal[1]

Abstract.—By using computer packages designed for qualitative data analysis, a researcher can increase trustworthiness (i.e., validity and reliability) of conclusions drawn from qualitative research results. This paper examines trustworthiness issues and the role of computer software (QSR's NUD•IST) in the context of a current research project investigating the social benefits of urban greening projects.

TRUSTWORTHINESS IN QUALITATIVE RESEARCH

Natural resource managers are sometimes skeptical about whether information from qualitative research is more sound than the general understanding they develop in other ways, through conversations with constituents, for instance. For qualitative text-based research to be meaningful to natural resource managers and policymakers they must understand and trust the research process and results. To achieve this goal, the work must be rigorous in terms of validity and reliability.

Yet qualitative researchers are still grappling with how best to judge qualitative work in terms of validity and reliability issues. Many reject quantitative research's labels and underlying constructs of internal validity, external validity, and reliability, choosing instead to create new terms more specific to and reflective of issues in qualitative research (Guba 1981, Lincoln and Guba 1985). Some reject these issues altogether, usually on the grounds that socially constructed meanings belie any possibility of "truth" (Guba and Lincoln 1994).

Most scholars, however, see the need for reliability and validity issues to be addressed carefully in qualitative research. In their discussions of these issues, scholars have created many new terms, terms that can get muddled quite easily. Guba and Lincoln's terms are used most often, and I will use them here (Guba 1981, Lincoln and Guba 1985). They talk of trustworthiness as the general issue, with credibility (akin to internal validity), transferability (akin to external validity), dependability (akin to reliability), and confirmability (akin to objectivity) as aspects of creating trustworthiness. Regardless of these and numerous other choices of terminology, the fundamental question is very real: how do we know whether or not to trust certain results? As Wolcott (1994) puts it, how do we know that we are getting it right?

There is a growing consensus on at least some tactics to increase trustworthiness in qualitative research. These include searching for negative evidence, searching for rival explanations, looking beyond dramatic evidence, linking one's findings and conclusions to both data and theory, conducting coding checks, and reporting in detail. Other tactics are less widely implemented but can be both useful and supported by computer analyses. Chief among these is creating audit trails. Computer software designed for qualitative data analysis can help ensure the rigor of analysis and results.

Before proceeding with the discussion of trustworthiness issues, I need to briefly outline my ongoing study that is used in this paper as an example to explore the issues of trustworthiness and specialized software in qualitative research. (At the time of this writing, I am in the middle of analyzing the data and am not presenting final conclusions from this project). The study investigates claims of social benefits to neighborhoods involved in urban greening projects, such as tree planting and community gardens (Lewis 1996). I selected four blocks in Chicago where residents had participated in Green Corps Chicago, a city-sponsored greening program. The sites were selected based on Green Corps practitioners' feeling that social benefits were outcomes of the projects: two sites were thought to have such benefits, two

[1] *USDA Forest Service, North Central Research Station, Forestry Sciences Laboratory, 845 Chicago Avenue, Suite 225, Evanston, IL 60202. E-mail: lwestphal@fs.fed.us*

were not. I interviewed both project participants and nonparticipants on each block to compare block residents' perceptions of change on their block to the Green Corps staff's views of that change.

THE QSR NUD•IST SOFTWARE[2]

I am using QSR NUD•IST™ version 4 for PCs (N4) to manage the copious amount of data (well over 800 pages of single-spaced text). NUD•IST is briefly explained in the foreword to this collection of papers; those interested in more detail about this and other qualitative data analysis software may want to visit the Computer Assisted Qualitative Data Analysis Software (CAQDAS) web site at: www.soc.surrey.ac.uk/caqdas/packages.htm

N4 does not restrict the researcher to any specific methodology for analyses: grounded theory, ethnography, case study, or other qualitative methods can all work in N4. Any text data can be imported into N4 for analysis, and N4 can also help analyze non-computerized data including government reports or photographs. The program can link with other analysis software like spreadsheets, statistical packages, and graphical analysis tools.

N4 allows the researcher to work with the data in several different ways. The researcher can work interactively, employ automatic coding, or both. Text searches can gather data meeting string or pattern search criteria for further analysis. Data can be coded finely or loosely, recoded, collapsed, and merged. Codes are arranged in an index tree, with a node for each code, text searches, or index search. Codes can be arranged hierarchically or not. In my current study I have used all of these approaches, using auto coding for demographic information, responses to the closed-ended questions, site, and participant/nonparticipant status. I have worked interactively with text search results, after careful coding of each text unit in a subset of the interviews.

Memoing is a tried and true method in text analysis where the investigator reflects on the data or topic at hand, its meaning, and implications for the analyses (Lofland and Lofland 1995, Strauss and Corbin 1990). N4 supports writing memos on both the documents and the codes. The memos track the development of ideas and are a useful place to record questions and issues for future clarification and exploration.

N4 has strong index search capabilities. This allows the researcher to slice the coded data any number of ways (e.g., finding out what older female project participants said about growing up in the South as it relates to trees), allowing the researcher to look for associations in the data and gather evidence as to their generality across the data. I think of these search functions as qualitative cross tabs.

N4 AND TRUSTWORTHINESS ISSUES

Earlier I discussed several of the trustworthiness tactics gaining consistent use in qualitative research. I will discuss them more fully here, with examples of how N4 can help to implement these tactics in practice. The trustworthiness tactics are: (1) searching for negative evidence and rival explanations, (2) looking beyond dramatic evidence, (3) linking one's findings and conclusions to both data and theory, (4) conducting coding checks, (5) creating audit trails, and (6) reporting in detail.

Issue: Searching for Negative Evidence and Rival Explanations

The search for negative cases and evidence is considered an important trustworthiness tactic by most qualitative researchers (Miles and Huberman 1994). It is thought to help increase credibility and confirmability. As researchers analyze data, they may have hypotheses, hunches, or "a-ha!"s that must be checked out. Finding the evidence that supports a hunch can be relatively easy. Searching out the evidence that might refute the hunch is another matter. But looking for this evidence is critical. There is some variation in opinion, though, in how the negative evidence must be handled. On one end of this continuum, Katz (1983) changed both his phenomena of study and his explanation of the phenomena to accommodate every and all negative evidence. This runs the risk of so diluting findings that they can be meaningless. Lincoln and Guba suggest "...perhaps the insistence on *zero* exceptions may be too rigid a criterion. Indeed, on its face it seems almost impossible to satisfy in actual studies..." (Lincoln and Guba 1985, p. 312). They go on to suggest that

---

[2] *Discussion of QSR NUD•IST does not imply an endorsement by the USDA Forest Service.*

a hypothesis supported by just 60 percent of the evidence can be sufficient. I think that the level of support needed depends on the conclusions being drawn. In my current study, conclusions about whether or not the greening projects were thought to be a positive change on the block need much support from the residents interviewed. Conclusions about the metaphors of cleanliness and dirt and their relationship to the greening projects may need less stringent levels of support because they are both more preliminary and based less on the face value of what respondents say. The more stringent support for this latter type of conclusion will be built over time and place as further studies are conducted.

Exploring rival explanations is related to the search for negative evidence. Both require researchers to try their hardest to debunk their own ideas. In quantitative research, the search for negative evidence involves the researcher looking for intervening variables, extraneous variables, and other potential causes of the phenomena under question. The qualitative analyst, too, must look for these variables in the interview text, photographs, or other qualitative data in the study.

How N4 Can Help

As Dey suggests, by using a computer in analyses of text data instead of "retrieving only those databits[3] which support our analysis, we can also retrieve those which are inconsistent with or contradict it. We can produce negative evidence as easily as positive evidence" (Dey 1993, p. 226). This negative evidence may then suggest rival explanations to explore. A simple example: say I hypothesize that greening project participants are more connected with their neighbors than nonparticipants. With an index search, N4 will produce for me *everything* anyone said (and I coded) about connectedness with neighbors, sorted by participant status. Or, if I have not coded for connectedness with neighbors, I can search on "neighbor" and any other word or phrase I think is a part of this phenomenon. N4 will present the results. I can then easily check for countervailing evidence to the idea that participants express closer neighborly ties. Perhaps participants will indeed have mentioned connectedness significantly more than nonparticipants—this would support my hypothesis. But perhaps respondents who did not participate in the greening project will talk of being connected with each other and not the greening project participants—maybe they even participated in a different project together. This challenges my hypothesis and leads to a rival explanation that a clique may have put in the greening project. Perhaps the neighborhood has problems with divisiveness. Or, it could suggest that different projects interest different types of people. The ability to see all the data sorted by participant status helps the researcher to see these alternative explanations and patterns and not just look at the evidence in support of an idea. Of course, each of these new ideas and explanations would need to be followed up in turn with searches for negative evidence and rival explanations.

Issue: Looking Beyond the Dramatic Evidence and Events

Another variation of the search for negative examples and data is the need to guard against basing conclusions on the most dramatic, sensational, or exciting data. This is a complicated issue. It is important to properly assess any given databit and to not rely on data that may stand out but actually be unrepresentative. At the same time, individual databits that at first glance might seem idiosyncratic and dramatic may trigger an important insight into the data.

In an earlier study, I investigated the motivations and values of urban tree care volunteers (Westphal 1993). In response to a question about favorite trees, one person said:

> *There was a huge oak tree at the bottom of our garden on our neighbors' side of the stream. One day when I was about 11 years old I came home from school and it had been cut down. Twenty-six years later there is still a wound in the sky.*

This is strong stuff, and the answer has stayed in my head in the years since that study. It would be a mistake to use this quote alone to argue for the importance of trees to children if there were not more evidence to support this idea—although in fact there were. But let us

[3] *Ian Dey (1993) uses this word to denote a bit of qualitative data. Highly contextual in meaning, a databit may be a word, phrase, photograph, or other piece of qualitative data.*

suppose there had not been additional supporting data. How do we handle this databit? Leave it aside altogether? No. In fact, this quote led me to look at the type of language the respondents used, and I found a high degree of poetic, aesthetic language (trees weren't described in cubic feet, but as giants; or the sky isn't blue, it's wounded). This proved to be one of the most intriguing results of this study.

How N4 Can Help

N4 can help researchers walk the fine line between overweighting dramatic data and following up interesting ideas prompted by these dramatic databits. N4 can produce a report indicating each answer to a given interview question, allowing a quick glance to reveal that only one respondent felt a certain way, even if they expressed themselves quite dramatically. N4 can also give data about the number of databits coded in any given category or set of categories. Seeing the full set of data facilitates looking beyond the dramatic evidence. At the same time, N4 allows the researcher to follow up the insights that may come from these dramatic bits of evidence, such as the use of poetic language as respondents talk about trees. The text and index search functions are particularly helpful in this regard, as is the ability to move easily between nodes and documents. These functions facilitate looking at the data from many angles.

Issue: Linking the Data to Conclusions and Theory

Another tactic on which there is near unanimity among researchers is the need to link data to conclusions. This seems obvious, because linking data to conclusions is a fundamental description of applied (if not all) research. But, unfortunately, I can readily think of articles based on field research where this has not been done. Scholars also suggest giving enough detail to "let the readers see for themselves" (Wolcott 1994, p. 350). Using sufficient quotes or other evidence from interviews is one approach to this concern, but the researcher's thought process must also be clear. Quotes alone do not link data, conclusions, and theory.

How N4 Can Help

N4 can help in several ways to ensure that conclusions are linked to the data. The memo function allows databits and researcher thoughts to be stored together for further reflection and analyses. For example, I have a code for community. I searched the interview texts for the word "community" and then read through this, noting how the word was used and who used it. This has led to two ideas, both of which are at least somewhat supported by the data: organizers tend to use the word "community" more often than other respondents, and "community" often means something like a group of people "pulling together." These ideas are explicated in the memo for "community," along with the text units supporting them. In this way, I am connecting conclusions with the data.

Some users of N4 use the software for their literature reviews as well, providing another opportunity to link data and theory. Data supporting or refuting a theoretical point can be coded to the same node as the literature citation. In a text or node search, both the theory and the data will be retrieved, allowing further analysis and a tight linking of theory, data, and conclusions. In my example above, I might code definitions of community from the scholarly literature with the definition of community emerging from my interview data, thereby linking data, conclusions, and theory.

Issue: Conducting Coding Checks

Like data cleaning in a quantitative study, it is important to check the coding in a qualitative study. This is important in studies with a solo researcher as well as in team research projects. In the case of a solo effort, intracoder reliability checks are a useful tool. In intracoder checks, the solo researcher codes raw data again, compares the first and second coding, and looks for a high level of agreement between the two coding passes. For team projects, intercoder checks are critical. In intercoder reliability checks, members of the team code the same data with the same coding scheme, again checking for a high level of agreement between the members. In either case, a low level of agreement requires a review of the coding procedures and code definitions, recoding of the data, and repeat coding checks. As in quantitative studies, what counts as "high" or "low" levels of agreement varies.

How N4 Can Help

N4 has several tools that help keep coding consistent, as well as reports that assist in

carrying out coding checks. Using the memos and node definitions, a researcher can specify the way certain codes are meant to be applied to the data. This helps to maintain accuracy during the coding process itself. I use memos extensively as I code data to record my thoughts of what fits in each coding category and why. When I have largely completed my preliminary analyses and coding, I codify the definitions before conducting intracoder checks. I then use N4's reports to compare which databits are coded to a particular code.

Issue: Creating Audit Trails and Conducting Audits

Audits and creating audit trails are trustworthiness tactics that are used less often by researchers. Like maintaining clear records that support your income tax deductions in case the IRS appears at your door, in a research audit trail you keep careful records of the process leading to your deductions from the data. And, like your tax records, it is not always easy (or fun!) to create an audit trail.

Lincoln and Guba advocate audits and creating audit trails (Lincoln and Guba 1985). Huberman and Miles also support the idea of audits, and point out that those audits that have been done, although few, have been helpful (Huberman and Miles 1994, p. 439). They suggest that due to time and cost constraints, audits may be limited to high-stakes studies (Huberman and Miles 1994, p. 440).

How N4 Can Help

N4 can do much of the work of creating an audit trail. Command files, memos documenting developing ideas and coding, archived copies of index trees (i.e., the coding structure and search results) all track the development of the project and allow a researcher or auditor to trace the process and thinking involved. For example: developing the index tree is a part of the analysis process. In my current research on the social benefits of urban greening, I am on my fourth major iteration and I expect at least one more major re-working of my index tree before I am finished. My first index trees were as nebulous as my thinking about the data. As ideas took shape, so too did the coding structure. In N4 when a node is moved from one location in the index tree to another, the program automatically notes this in the node memo, allowing a researcher to trace the movement of a concept as the analysis progresses. For instance, say my "neighborhood" text search results do show a clique was formed. I might move these data from the text search section to a "social interactions" part of the index tree. Archiving copies of the index tree allows a researcher to trace the development of the analysis. This sort of information is useful in an audit, as well as in further refining of analyses and conclusions.

Issue: Detailed Reporting

Detailed reporting is critical to any research, but is perhaps even more important in qualitative studies. Miles and Huberman suggest that detail in methods reporting has been lacking in qualitative studies and is also critical to "judging the goodness of conclusions" (Miles and Huberman 1994, p. 281). Because many scientific disciplines have a standard body of validity and reliability tools for quantitative work, it is easier to report in a kind of shorthand that needs little, if any, explanation. Qualitative work does not have this yet, and given the diversity of methods and approaches, it may never have it.

How N4 Can Help

Using the memo function in N4, archiving index trees, saving command files—in other words, using your audit trail—also helps in reporting fully and accurately the findings and conclusions drawn from a qualitative study. From these materials, the researcher can explain in clear detail the development of ideas, the coding methods employed, the queries made of the data, and other important methodological information. Reporting in detail also requires reporting on other tactics such as the search for negative evidence, as discussed above. Additionally, reporting in detail requires intimate familiarity with the data. N4 supports many different ways of looking at and analyzing the data, from up close to big-picture. This, in turn, supports the level of intimacy needed to present ideas and conclusions clearly and in detail.

CONCLUSIONS

The papers in this volume demonstrate that research using qualitative text analysis can provide valuable insight and policy guidelines for natural resource managers, from understanding the issue-driven nature of public

opinion about resource management to including sense of place in opportunity area planning. But for the information from these types of projects to be used, the conclusions must be perceived to be of high quality and rigor—they must be trusted. Increasing the trustworthiness of results and conclusions in qualitative research can be greatly assisted by computer packages like N4, helping researchers go deeper into their data, allowing them to easily trace the development of ideas and constructs, facilitating the reporting process, and facilitating the search for negating evidence.

It is important to recognize that no software packages for analyzing text data will do the analysis for you. But they can increase the trustworthiness of the results, and thereby help managers and policymakers see the usefulness of text-based analyses in solving their everyday problems.

LITERATURE CITED

Dey, I. 1993. **Qualitative data analysis: a user-friendly guide for social scientists**. London: Routledge.

Guba, E.G. 1981. **Criteria for assessing the trustworthiness of naturalistic inquiries**. Education, Communication, and Technology Journal. 29(2): 75-91.

Guba, E.G.; Lincoln, Y.S. 1994. **Competing paradigms in qualitative research**. In: Denzin, N.K.; Lincoln, Y.S., eds. Handbook of qualitative research. Thousand Oaks, CA: Sage Publications Inc: 105-117.

Huberman, A.M.; Miles, M.B. 1994. **Data management and analysis methods**. In: Denzin, N.K.; Lincoln, Y.S., eds. Handbook of qualitative research. Thousand Oaks, CA: Sage Publications Inc: 643.

Katz, J. 1983. **A theory of qualitative methodology: the social system of analytic fieldwork**. In: Emerson, R.M., ed. Contemporary field research: a collection of readings. Prospect Heights, IL: Waveland Press, Inc.: 127-148.

Lewis, C.A. 1996. **Green nature/human nature: the meaning of plants in our lives**. Urbana, IL: University of Illinois Press.

Lincoln, Y.S.; Guba, E.G. 1985. **Naturalistic inquiry**. Thousand Oaks, CA: Sage Publications Inc.

Lofland, J.; Lofland, L.H. 1995. **Analyzing social settings**. Belmont, CA: Wadsworth Publishing Co.

Miles, M.B.; Huberman, A.M. 1994. **Qualitative data analysis: an expanded sourcebook**, 2d ed. Thousand Oaks, CA: Sage.

Strauss, A.; Corbin, J. 1990. **Basics of qualitative research: grounded theory procedures and techniques**. Thousand Oaks, CA: Sage Publications.

Westphal, L.M. 1993. **Why trees? Urban forestry volunteers values and motivations**. In: Gobster, P.H., ed. Managing urban and high-use recreation settings. Gen. Tech. Rep. NC-183. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 19-23.

Wolcott, H.F. 1994. **Transforming qualitative data: description, analysis, and interpretation**. Thousand Oaks, CA: Sage Publications Inc.

What Makes a Place Special? Interpretation of Written Survey Responses in Natural Resource Planning

Herbert W. Schroeder[1]

Abstract.—In an open-ended, written survey, I asked residents and visitors of the Black River area in northern Michigan to identify and describe places that were special to them. I conducted a thematic interpretation of the responses, using a set of indexing and cross-referencing macros that I wrote in Word Perfect 5.1. The themes that emerged included the natural beauty of the area, its quiet and uncrowded character, the history of the harbor and fishing community, and the high quality of recreation facilities. The Ottawa National Forest used this information in developing a plan for future management of the Black River area.

The decisions made by natural resource managers have wide-ranging effects on a variety of features and processes of ecosystems. Not least among these effects are those on the human beings who live in and visit the areas being managed. These human impacts go beyond the biological and physical domains to include the thoughts, meanings, and feelings associated with places and areas in people's minds. Understanding these impacts is not always easy, but it is a necessary part of ecosystem management (Mitchell *et al.* 1993, Schroeder 1996a, Williams *et al.* 1992). Even the best intentioned and most scientifically well-founded ecosystem management efforts can be brought to a standstill by controversy, if people believe that their deeply held feelings and values are threatened by management actions.

Managers can begin to gain understanding of people's feelings and values through informal day-to-day interaction with the public, as well as through more formal public involvement activities. Research studies carried out by social scientists in cooperation with managers can provide additional valuable information for resource planning. Open-ended, qualitative approaches to data gathering and analysis can be particularly useful, given the variety and the complexity of meanings and values that can be associated with particular places. This paper summarizes a qualitative study that I conducted with the Ottawa National Forest as part of their opportunity area analysis for the Black River area of northern Michigan. It provides one example of a research approach that can be used to help forest managers learn about the human meanings and values that will be impacted by their decisions.

The Black River area, located on the Lake Superior shore of Michigan's Upper Peninsula, includes a National Scenic River, a Scenic Byway, and a National Scenic Trail. There are several large waterfalls on the river, as well as some outstanding groves of hardwoods, pine, and old-growth hemlock. Recreation facilities include a campground, a picnic area, and a rustic, historic harbor. Through both personal experience and interaction with visitors and residents, the staff of the Ottawa National Forest was aware that the Black River had a special character and meaning for many people. The Black River Opportunity Area planning team particularly wanted to include public values and feelings about the area in the planning process. Therefore, they invited me to help them with a research study to find out more about people's attachment to the Black River area.

DATA AND METHODOLOGY

The research approach I used was based on an earlier study I had conducted at the Morton Arboretum near Chicago (Schroeder 1991). The first step was to design a one-page flier announcing the Black River "Special Places" Study. The flier briefly described the purpose of the study and invited anyone who was

[1] *USDA Forest Service, North Central Research Station, Forestry Sciences Laboratory, 845 Chicago Avenue, Suite 225, Evanston, IL 60202. E-mail: hschroeder@fs.fed.us*

interested in participating to contact me. The Ottawa National Forest planning team mailed the flier to people on their public involvement mailing list for the Black River Opportunity Area. The flier was also posted in Forest Service offices, local businesses, and recreation sites where local residents and visitors to the Black River area could pick it up.

Fifty-five people responded to the flier by sending me their names and addresses. I sent these people instructions for writing about their special places. The response format was designed to be as open as possible, so that people could describe their experiences in their own words. The instructions asked the participants to think of from one to four places within the Black River area that were special to them; to describe these places; and to explain what thoughts, feelings, memories, and associations came to mind about these places. Twenty-three people sent me descriptions of their special places. These respondents included about equal numbers of residents and visitors, a few of whom had lived or vacationed in the Black River area since childhood.

The process I followed for interpreting and summarizing the responses involved several steps. First, I typed all of the survey responses into a Word Perfect 5.1 document on an IBM compatible PC. Then I divided each response into smaller units of text. Each text unit consisted of one or more phrases or sentences that expressed a more or less distinct idea or theme. I read each text unit carefully and in a separate document began developing an outline of the general themes and concepts that were being mentioned. As I read through the responses, I built upon the initial outline by adding topics and dividing general topics into more detailed subtopics. I marked each text unit with codes to indicate which topics from the outline applied to it. My goal was to have each unit of text linked to at least one entry in the topic outline.

When I had finished reading, outlining, and cross-referencing the text units to the topics in the outline, I tallied the frequencies with which each topic appeared in the survey responses. My purpose in doing this was not to quantify the data in any precise way, but simply to give myself an idea of which topics I was finding most frequently across respondents. Then I began to write a report of the survey responses, including the most frequently mentioned topics as well as any other information that seemed important or useful for the planning team to have. In particular, I included in the report any specific problems or recommendations for future management of the Black River area that the respondents mentioned. In writing the report, I referred back to the original text to find quotations illustrating each of the topics I presented.

To facilitate the steps of the analysis described above, I wrote a set of word processing macros[2] to perform the required tasks of indexing, cross-referencing, searching, and tallying the frequency with which topics appeared in the text. Text units were delimited by special characters in the word processing document, and topic codes were inserted as footnotes at the beginning of each text unit. The word processor's search function could then be used to go from the outline back to the original text and retrieve instances of text units relating to each topic or subtopic. Macros for browsing the outline and inserting topic codes into the text were set up as "keyboard macros," so that they could be invoked quickly with single keystrokes. Additional macros for tallying and displaying frequencies of topic codes in the text took advantage of the word processor's built-in sorting and tabular math capabilities.

There were several distinct advantages to using word-processing macros to carry out the outlining and coding process. First, it enabled me to carry out all the stages of data entry, interpretation, coding, and report writing entirely within the word-processing software. The alternative would have been to enter the data in a word processor, export it to a commercial text analysis package for interpretation and coding, and then return to the word processor to write the report. The full editing and search capabilities of the word processor were available to me at all times, which meant that I could edit, correct, and reformat the text easily, even after beginning the interpretation phase. This gave me considerable flexibility, for example, in working with text units. I did not have to define the text units in a fixed way (e.g., as lines, sentences, or paragraphs) before beginning my analysis. I could easily redefine,

---

[2] *A macro is a computer program written in a special programming language designed to automate sequences of word processor operations and commands.*

split, and merge text units as needed while in the midst of the analysis. In this way, the text units could more naturally conform to the way meanings were expressed in the text. In some cases this allowed for a more precise or "fine-grained" coding of the text. For example, if a sentence was found to contain two distinct ideas or themes, then the sentence could be broken into two text units, one for each theme, rather than having to assign the codes for both themes to the entire sentence.

As I gained experience with the analysis process, I was able to tailor the macros to suit my own particular style of coding. This enabled me to assign topic codes rapidly to text units with a minimum of keystrokes. Also, I could design the macros to provide precisely the analytic features that I wanted for the type of data I was analyzing. For example, I set up the macros so that I could tally the frequency of topics at any of three levels—by text units, by place descriptions, or by survey respondents. When searching for and tallying topics, I programmed the macros so that I could easily switch between hierarchical and non-hierarchical approaches.[3]

The primary disadvantage in this approach, of course, was the extra time and work it took to write, test, and debug the macros. This was not a simple task, and if I had used these macros only for this one project, it would probably not have been worth the effort. Since I have been able to use them for several other similar studies, however, I feel that the investment has been more than repaid. Thus, I would recommend that researchers who have some facility in computer programming consider using the powerful macro languages included in many word processing packages as a tool for carrying out text analysis.

RESULTS AND DISCUSSION

In this section I will give a brief description of the most important findings of this study, relating to the meanings, experiences, and values that the survey respondents associated with the Black River area. A more detailed account of the survey responses can be found in Schroeder (1996b).

First of all, it was immediately clear that these people have strong positive feelings for the Black River area. They used words like "great," "fantastic," "marvelous," and "wonderful" to describe the river and its surroundings. Three people went so far as to call the Black River area a "heaven" or a "paradise." Some people said that they felt grateful for being able to visit or live in a place like the Black River area. One resident said simply, "Living here is a privilege and blessing."

Beauty was one of the qualities of the Black River area that was mentioned most often. One resident of the area wrote, "The pleasure I get from living within and sharing a place of beauty that is my home is hard to describe." Along with natural beauty, people also described a sense of serenity or peace. For example, one person wrote, "It is so very quiet and relaxing. To walk the beach gives a person a very peaceful feeling." Many people attributed the beauty and serenity of the Black River to its natural and undeveloped condition. They referred to the rustic, primitive character of the area and its relative isolation. One person wrote, "It is beautiful and the feeling of wilderness lakeshore is great." Several other people also used the word "wilderness" to describe the area. Even with the developed recreation sites, trails, and other users in the area, the Black River is not crowded and people can find opportunities for solitude and privacy.

Other aspects of the natural character of the area that people wrote about were its pristine quality, the clean air, and especially the crystal-clear water of the lake. People also wrote about the abundance of natural features—the diversity, uniqueness, and rarity of the plants, animals, and geology of the area. For some people, the beauty of these natural features evokes powerful feelings. One person said that his first hike on the North Country Trail was such a beautiful experience that it gave him chills down his spine. The water rushing over the waterfalls gives a sense of force and energy that one person referred to as "mesmerizing." Another person said that the grandeur of the old-growth hemlocks gave a spiritual sense of the "majesty of nature and the minuteness of man."

---

[3] *In a hierarchical approach, each occurrence of a subtopic in the text also counts as an occurrence of every "parent" topic above it in the hierarchy. For example, an occurrence of the topic "conifers" would also count as an occurrence of the more general topics "trees and forests" and "vegetation." In a non-hierarchical approach, the parent topics are counted only if they are explicitly coded to the text unit.*

In addition to the natural features of the Black River area, the people there also contribute to its specialness. The Black River is a friendly place, and people enjoy meeting and talking to other visitors and to the people who live and work in the area. One person wrote, "I have met a lot of good people down at the bottom of the falls in the 35 years I have fished here." The history of the area as a commercial fishing community is also important, especially for those people whose families were a part of this history. Two people in particular wrote detailed reminiscences of their childhood experiences and of their parents' and grandparents' roles in the history of the harbor.

Some people recalled difficulties or hardships of the past, and elements of difficulty and danger still exist. The rougher elements of the Black River area include the strong winds on the lake and high water over the waterfalls at certain times of year. One person wrote about a bear that had torn off the steps of her cabin and part of her porch. But these dangers and difficulties don't seem to detract from people's feelings for the area. If anything, they evoke a sense of respect. The only feature of the Black River area that was described in consistently negative terms was the black flies.

People who have lived in the Black River area for a long time have seen many changes take place. Some of these changes they experience as positive, such as improvements in the harbor facilities, docks, and access to the waterfalls. Some changes they experience as negative—one person complained about the intrusion of the campground into what had been a favorite wooded area, and another was concerned about the increasing traffic on Black River Road. But, generally, the people who participated in this survey seem to view human influence and management as beneficial to the Black River area. People praised the high quality of the construction, maintenance, and cleanliness of recreation facilities. Several older people especially appreciated the measures taken by managers to increase access to the waterfalls. One person who walks with a cane said that "the wide paths recently put in are a blessing to handicapped people."

With respect to the future, some people pointed out opportunities for developments they thought would enhance the Black River area. But for the most part, these people said that they like the Black River as it is now, and they were concerned that future changes and development might spoil the qualities that make the area special. The single most frequent recommendation for management from these people was to limit development and maintain the area as it is. One resident wrote, "We love and respect it, and fervently hope it is not improved to death. Let Nature do what she does so *well* ... mostly we want it to stay pristine and quiet. Please, no more improvements!"

In general, the results described above were corroborated by information obtained in the other public involvement activities conducted by the Black River Opportunity Area team. Based on all their interactions with the public, the planning team established the desired future condition for the Black River Opportunity Area as "maintaining the character and facilities of the area, with an emphasis on non-motorized use east of the byway" (USDA Forest Service 1995).

CONCLUSIONS

The purpose of this study was to gain a better understanding of the strong attachments that residents and visitors feel for the Black River area. To achieve this purpose, I employed an open-ended survey to elicit residents' and visitors' meanings, feelings, and values relating to the Black River. With the aid of word processing macros, I distilled themes and concepts that characterized people's descriptions of their special places in the Black River area. The findings provided insights into the experiences that give rise to strong place attachments and identified some of the specific places, qualities, and features of the Black River area that are most important to people. The Ottawa National Forest was subsequently able to incorporate these insights into their planning process.

While this study provides useful information on the relationship between people and the Black River area, it also has some limitations that must be taken into account when using the results. The survey employed a voluntary, self-selected sample of people. This was an efficient and cost-effective way of ensuring that the sample would include people who had experienced the kinds of feelings that I wanted to learn about. The non-random nature of the sample, however, means that the survey cannot be used to estimate the proportion of the general population that holds the various views

represented in these responses. For example, because the survey specifically asked people to write about places that are special to them, it seems likely that the respondents would be more oriented toward preserving these places in their current condition than would a random sample of the population. By itself, this survey cannot measure how important the respondents' experiences are compared to other valued uses of the Black River area, nor can it resolve issues such as how the benefits of preserving the character of the area should be balanced against the benefits of increasing development and tourism. Therefore, this study should be viewed as one source of input in a larger planning and public involvement process.

Making decisions about managing natural places and features that are important to people will always be a complex and difficult task. Qualitative surveys, in which people can speak in their own words about places that are special to them, may help natural resource managers to carry out this task with greater awareness of the feelings and values that people hold for these places.

ACKNOWLEDGMENTS

I would like to thank Sherri Schwenke, Jim Jordan, Jill Leonard, Dennis Dufrane, Mike Jacobson, and Rick McVey of the Ottawa National Forest for their assistance and cooperation in carrying out this study. I also thank all the residents of and visitors to the Black River area who took time to participate in this research.

LITERATURE CITED

Mitchell, M.Y.; Force, J.E.; Carroll, M.S.; McLaughlin, W.J. 1993. **Forest places of the heart: incorporating special spaces into public management**. Journal of Forestry. 91(4): 32-37.

Schroeder, H.W. 1991. **Preference and meaning of arboretum landscapes: combining quantitative and qualitative data**. Journal of Environmental Psychology. 11: 231-248.

Schroeder, H.W. 1996a. **Ecology of the heart: understanding how people experience natural environments**. In: Ewert, A., ed. Natural resource management: the human dimension. Boulder, CO: Westview Press. 263 p.

Schroeder, H.W. 1996b. **Voices from Michigan's Black River: obtaining information on "special places" for natural resource planning**. Gen. Tech. Rep. NC-184. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 25 p.

USDA Forest Service. 1995. **Black River Opportunity Area analysis**. Bessemer, MI: U.S. Department of Agriculture, Forest Service, Ottawa National Forest, Bessemer District. 120 p.

Williams, D.R.; Patterson, M.E.; Roggenbuck, J.W.; Watson, A.E. 1992. **Beyond the commodity metaphor: examining emotional and symbolic attachment to place**. Leisure Sciences. 14: 29-46.

Exploring Residents' Perceptions of a Natural Protected Area Using Computer-Aided Analysis of Interview Text

Terilyn D. Allendorf[1]

Abstract.—I used computer-aided analysis of interview text to explore residents' perceptions of Royal Bardia National Park in Nepal. Residents' perceptions of the park were analyzed by identifying the positive and negative attributes they associated with the park and exploring relationships between the attributes. A coding strategy for interviews was developed to identify and code attributes identified in previous surveys. QSR NUD•IST was used to code text, tag quotes within interviews referring to the different attributes, and explore relationships among attributes.

Conflicts between protected areas and local residents are well documented and often threaten the management goals of protected areas. Recognition that local people are integral to the successful conservation of protected natural areas is responsible for the increasing emphasis on research and development projects focusing on "park-people relations" over the past two decades (Dasmann 1984, Fiallo and Jacobson 1995, Furze *et al.* 1996, Hough 1989, Newmark *et al.* 1993, Zube 1986).

Projects to improve park-people relationships generally focus on providing people with economic benefits (1) from the park directly, (2) through tourism and development projects near parks, or (3) by decreasing sources of conflict such as crop damage and livestock depredation by park wildlife. Research has followed this same economic-centered approach, emphasizing identification of sources of conflict and descriptions of the extractive relationships between people and parks. However, researchers have given little consideration to the positive aspects of park-people relationships. In this study, I used a computer-aided text analysis of interview data to explore the meaning of positive and negative attributes that local residents associate with Royal Bardia National Park (RBNP) in Nepal and the relationships among those attributes.

[1] *Conservation Biology Graduate Program, University of Minnesota, St. Paul, MN 55108. E-mail: allen094@tc.umn.edu*

A QUALITATIVE RESEARCH APPROACH

Park-people research in developing countries is relatively immature; most research consists of descriptive case studies that lack a conceptual framework. Past research often assumed that the primary component of the park-people relationship is economic, that identification of conflict is most relevant to improving relations, and that basic needs development (raising the standard of living) will improve people's attitudes toward the park. Before accepting these assumptions, it is important to explore park-people relations in a way that lends itself to building theory based on an understanding of how local residents perceive their relationship with protected areas. Qualitative research is best suited to understanding the meanings people give to their lives (Miles and Huberman 1994, van Manen 1977).

STUDY SITE

Royal Bardia National Park (RBNP), located in the southwestern terai of Nepal, was established in 1969 as a hunting reserve. It became a national park in 1989. The 968-km^2 area is managed by the Department of National Parks and Wildlife Conservation (DNPWC). As in most national parks and reserves in Nepal, the Royal Nepalese Army is responsible for guarding the park and enforcing its rules and regulations, including such tasks as controlling poachers, stopping illegal fishing, checking boundaries, preventing encroachment into the park, and preventing livestock grazing and extraction of resources by area residents.

DATA COLLECTION

Data for this study were obtained through in-depth interviews in three communities adjacent to RBNP and one located in an adjacent district. I used a purposive sampling approach both for the communities chosen and for the individuals interviewed. Interviews were based on an interview guide (Patton 1990) with two parts. The first part was intended to elicit opinions that interviewees had already formed, and the second part was intended to probe more deeply to see how people would respond to questions about which they might not yet have formed opinions. However, application of this interview guide in the field was problematic and, more often than not, I used a less structured approach that Patton (1990) describes as informal conversational interviews. This allowed the interview to follow the interests of the interviewee more closely and maintain her/his interest. Most rural residents of Nepal are not used to surveys and formal interviewing, so I did the interviews in ways that would help put people at ease. I tried to make the interviews as much of an exchange as possible, letting people talk to me and ask me questions as they wished. I attempted to establish a sense of trust and comfort with people before I began the interviews. After I asked my questions, I let them carry the conversation where they wanted. At times, this would happen even before the interview had finished. If a person was not comfortable, I did not conduct the interview. Often, interviews became group interviews as other people joined the conversation or if a person felt uncomfortable being interviewed alone.

ANALYSIS

Three Nepalese people—a nongovernmental organization (NGO) worker and two college students—transcribed the interviews into Nepali written in the English alphabet. I translated these transcriptions into English with help from two native Nepali speakers. Interviews were typed into Microsoft Word.

Data were analyzed using the qualitative data analysis program QSR NUD•IST. Interviews were imported as text files from Microsoft Word. Analysis began with coding perceived positive and negative attributes of the park and the wildlife of the park identified in a previous study conducted by the author (Allendorf 1998). Positive attributes of the park included, for example, clean air, breezes and shade, beauty, and extraction benefits. Negative attributes included, for example, crop damage by park wildlife, restricted entry, and no legal extraction. I coded interviews in two ways. First, I read each interview, coding text that referred to any of the attributes using the index system available in NUD•IST. The index system allowed me to create nodes, which correspond to categories, in a hierarchical tree format. I had two main nodes, "positive attributes" and "negative attributes," under which were general subnodes (fig. 1). For the

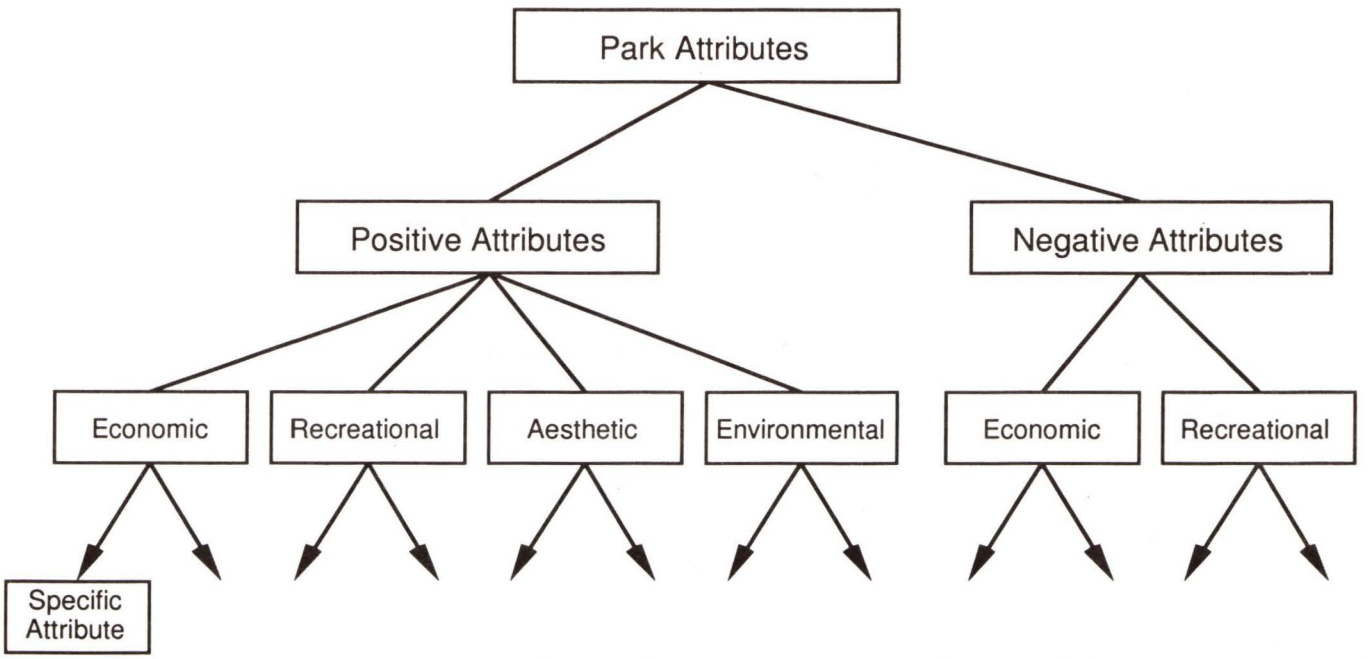


Figure 1.—*Hierarchical tree showing how park attributes were coded using QSR NUD•IST.*

positive attributes, these nodes included recreational, aesthetic, environmental, and economic attributes. Specific positive attributes fell under these four nodes. For example, if I coded a piece of text as referring to the park's beauty, NUD•IST also marked the text as both a positive and an aesthetic attribute. Second, I double-checked my coding by conducting searches of interview text for words that referred to the attributes, such as the word "beauty."

In the next phase of the analysis, I explored relationships among the park attributes by conducting searches of the index system. I used NUD•IST's "search index system" function to look for the intersection between different categories of attributes. For example, to explore the relationship between aesthetic and recreational attributes, I wanted to find all the units of text where people discussed both those categories of attributes. The search index system function allows for a number of different types of searches, which facilitates organization and exploration of categories.

Finally, I used NUD•IST's memo function to keep track of ideas and issues to explore as they occurred to me during the analysis. The memo function is a powerful way to keep track of ideas and theories about the data. Memos can be linked to categories or to files and allow the researcher to maintain a running log of ideas about the data and their analysis.

CONCLUDING COMMENTS

QSR NUD•IST was an efficient and easy tool for conducting computer-aided qualitative data analysis of interviews about people's perceptions of a national park. It facilitated management and retrieval of interview files, coding and retrieval of interview text, retrieval of text that referred to specific attributes, and exploration of relationships among coded categories. Additionally, it allowed coding to evolve as the analysis was conducted by allowing for the division of nodes and the movement of nodes around the hierarchical tree. The only drawback was a limited ability to edit text once it was imported into NUD•IST.

LITERATURE CITED

Allendorf, T. 1998. **Local residents' perceptions of protected areas in Nepal: beyond conflicts and economics**. Unpublished manuscript, Conservation Biology Program, University of Minnesota, St. Paul, MN.

Dasmann, R.F. 1984. **The relationship between protected areas and indigenous people**. In: McNeely, J.A.; Miller, K.R., eds. National parks, conservation, and development. Washington, DC: Smithsonian Institution Press.

Fiallo, E.A.; Jacobson, S.K. 1995. **Local communities and protected areas: attitudes of rural residents towards conservation and Machalilla National Park, Ecuador**. Environmental Conservation. 22(3): 241-249.

Furze, B.; de Lacy, T.; Birckhead, J. 1996. Culture, conservation, and biodiversity. New York, NY: John Wiley and Sons.

Hough, J.L. 1989. **National park-local people relationships: case studies from Northern Benin, West Africa and the Grand Canyon, USA**. University of Michigan. Ph.D. dissertation.

Miles, M.B.; Huberman, A.M. 1994. **Qualitative data analysis: an expanded sourcebook**. Thousand Oaks, CA: Sage Publications.

Newmark, W.D.; Leonard, N.L.; Sariko, H.I.; Gamassa, D.M. 1993. **Conservation attitudes of local people living adjacent to five protected areas in Tanzania**. Biological Conservation. 63: 177-183.

Patton, M.Q. 1990. **Qualitative evaluation and research methods**. Newbury Park, CA: Sage Publications.

van Manen, M. 1977. **Linking ways of knowing with ways of being practical**. Curriculum Inquiry. 6(3): 205:228.

Zube, E.H. 1986. **Local and extra-local perceptions of national parks and protected areas**. Landscape and Urban Planning. 13: 11-17.

Turning Qualitative Text Into Interval-level Data: A Computer Content Analysis Approach

Chad D. Pierskalla and Dorothy H. Anderson[1]

Abstract.—The methodology of a computer content analysis of text collected during Isle Royale National Park (Michigan) visitor interviews is presented. For demonstration purposes, Minnesota Contextual Content Analysis (MCCA) software was used to code word patterns in textual data collected during the Isle Royale interviews. The MCCA program consists of a dictionary of the most frequently used words in the English language, and it is used to disambiguate and categorize word meanings of a wide variety of general social science concepts. Two types of continuous and interval-level measures are computed by the program: (1) emphasis or e-scores are computed for 116 idea/word categories and are measures of the overemphasis or underemphasis of visitor ideas compared to usual English usage; (2) contextual or c-scores are computed for four social perspectives (traditional, practical, emotional, and analytical) and are measures of the overemphasis or underemphasis of a social perspective of a text. These scores were loaded into a statistical package for further analysis. Selected results from these analyses (e.g., multidimensional scaling) are presented in this paper and issues related to computer content analysis are raised.

Researchers working in the human dimensions of natural resources are faced with a number of challenges when conducting studies of the human environment. The relationships that exist between humans and the environment present complex phenomena that are difficult to understand when limited to either quantitative or qualitative analyses. **Quantitative approaches** enable researchers to measure qualitative attributes with high levels of reliability. However, the sometimes speculative nature of human/environment relationships makes it difficult to identify and operationalize these attributes; therefore, quantitative approaches can lack validity. On the other hand, **qualitative methods** are often associated with exploratory research undertaken to examine new concepts, explanations, and theories. Henderson (1991) says that using a qualitative approach "... is like starting on an exciting adventure in which the researcher may not know what ups and downs, twists and turns, and final destination may be reached" (p. 47). Given the speculative nature of human/environment relationships, qualitative analyses can strengthen the validity of research. However, qualitative analysis such as hand-coded content analysis requires the development and application of coding rules that can lead to unreliable results. Considering that researchers work with limited resources, how can studies of the complex human environment adequately address both reliability and validity? In this paper, we argue that computer content analysis approaches can be used to meet these difficult challenges. For demonstration purposes, we present a computer content analysis methodology and selected findings of an Isle Royale National Park visitor study. We conclude by discussing the advantages and disadvantages of this approach.

METHODOLOGY

Data were collected at Isle Royale National Park (Michigan), a large island in Lake Superior, during the summer of 1997 for a study to assist park planning that was currently underway. The purpose of the study was to better understand the range of leisure events that are realized by visitors.

The operational definition of leisure events was guided by ecological perception theory (see Pierskalla and Lee 1998). Ecological perception theory suggests that humans perceive styles or patterns of change in the environment. For

[1] *Department of Forest Resources, University of Minnesota, St. Paul, MN 55108. E-mail: piers014@tc.umn.edu or danderso@forestry.umn.edu*

example, visitors of Isle Royale National Park might perceive changes in topography, weather, scenery, and temperature. These perceived patterns or styles of change afford either good or ill to visitors. For example, change in topography affords climbing activities, exercise, fatigue, and skill development. Together, perceived patterns or styles of change and their associated affordances or provisions define leisure events.

Eighty-one backcountry visitors were randomly selected throughout the island and asked to participate in the study. Study participants were asked to describe what happened to them during a 24-hour period of time. Twelve interview questions were developed, which helped facilitate the storytelling process. The interviews were tape recorded and transcribed into text.

The transcribed text was aggregated for each study participant and examined using a computer content analysis technique. Minnesota Contextual Content Analysis (MCCA) software was used to systematically code word patterns in the open-ended text. The MCCA program contains a dictionary of words that accounts for about 90 percent of English usage. These words have been assigned to mutually exclusive idea categories that cover a wide variety of general social science interests (e.g., reasoning, guide, location, past, future, colors, spatial sense, to plan, sense, move-in-space, about changing, different, feeling, bad, good, qualities, physical setting, happy, speed, similarity, differentiate, processing things, activity, timing, begin action, depressed, dislike, disastrous, and community). The program counted each word of the 81 texts once, and disambiguated words with multiple meanings. By dividing the words of text into idea categories, the program was able to calculate normed scores for each of the 116 idea categories (McTavish and Pirro 1990). That is, "...the difference between the proportion of all words in a text that are in a given category minus the expected use of the category's words" was calculated (McTavish 1997, p. 381). The normed scores reflect the overemphasis or underemphasis of each idea category.

MCCA uses the whole profile of the normed scores as conceptual calculations of c-scores (i.e., contextual scores). C-scores that are assigned to each text are a measure of emphasis on traditional, practical, emotional, and analytic perspectives or the context of language.[2] In this study, c-scores represent the type of localized leisure events visitors perceive and realize at Isle Royale National Park. A high c-score represents an overemphasis of a type of leisure event while a negative score represents an underemphasis.

SELECTED FINDINGS

The c-scores were loaded into the Statistical Program for the Social Sciences (SPSS/PC+) and analyzed. The summary statistics for each social perspective are reported in table 1. A disaggregate analysis (i.e., INDSCAL or Individual Differences SCALing) of the four social perspectives or c-scores was conducted, and each response (n=81) was plotted on a two-dimension spatial map for evaluation (fig. 1). The social perspective labels (i.e., traditional, practical, emotional, and practical perspectives) were included in the perceptual map and serve as benchmarks that help define the range of leisure events. The model fit the data with stress=.12 (a badness-of-fit measure) and R-squared=.97.

Various leisure events realized in the human environment of Isle Royale National Park are identifiable in the perceptual map (fig. 1). The more common leisure events have an emotional or an analytical/practical perspective. No leisure events had a dominant traditional perspective. (See footnote 2 for definitions of the four perspectives). These results are reliable because computer-coded content analysis is consistent—the program always applies the coding rules consistently. However,

---

[2] *McTavish and Pirro (1990) defined the four contexts:*
"(a) Traditional Context. A normative perspective on the social situation predominates and the situation is defined in terms of standards, rules and codes which guide social behavior.
(b) Practical Context. A pragmatic perspective of the social situation predominates and behavior is directed toward the rational achievement of goals.
(c) Emotional Context. An affective perspective predominates and the situation is defined in terms of expressions of emotion (both positive and negative), and maximizing individual involvement, personal concern and comfort.
(d) Analytic Context. An intellectual perspective predominates and the situation is defined in objective terms" (p. 251).

Table 1.—*Summary statistics for the social perspectives of the 81 interview texts*

Social perspective	Mean c-scores*	Variance of c-scores
Analytical	-8.6	131.2
Traditional	-5.0	54.5
Practical	-4.0	94.9
Emotional	17.6	159.3

*Scores indicate an overemphasis (positive scores) or underemphasis (negative scores) of a social perspective.

use of MCCA may oversimplify the complexity of leisure events and is at risk of lacking validity. To help strengthen the validity of the methodology, the results reported in figure 1 were used to guide a qualitative analysis.

A qualitative analysis was conducted to describe the patterns or styles of change and affordances associated with each type of leisure event identified during the quantitative analysis. For example, the pure emotional events were often associated with short hikes over changing topography. These changes afforded enjoyable scenery and positive emotions. The analytical/practical events were often associated with longer hikes over changing topography. These changes afforded exercise, more difficult challenges, and accomplishment of goals (e.g., getting to the ferry boat for a scheduled departure from the island). These findings increase our confidence in the validity of the MCCA analysis. The reliability of MCCA and the validity provided by the qualitative analysis improved the quality of the Isle Royale visitor study.

DISCUSSION

MCCA, the computer content analysis software package used in this study, has several advantages and disadvantages. Many of the disadvantages of MCCA were minimized by the addition of a qualitative analysis.

Advantages of MCCA

Six key advantages of MCCA allow social scientist to meet a variety of research challenges. (1) The software handles a large number of texts and volume of textual data quickly and easily. Ninety-five pages of single-spaced text from 81 visitor interviews were analyzed in this study by MCCA within minutes. This is an important advantage considering the large volume of text that is now available (e.g., from the Internet and commercial online databases). (2) MCCA is applicable to a wide range of social science issues because it divides words of a text into a large number (116) of idea categories. This allows social scientists to examine the complexity of various human environments. (3) Researchers are able to collect

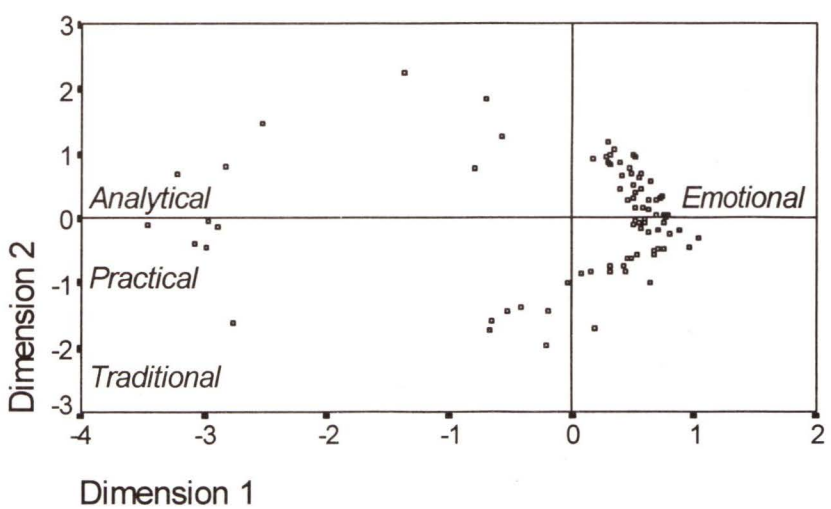


Figure 1.—*A perceptual map of leisure events that were realized by Isle Royale National Park visitors.*

qualitative data (e.g., interview text) when using MCCA. Qualitative data allow social scientists to cover a larger context that surrounds complex issues characteristic of the human environment. The text is converted into quantitative data by MCCA. (4) MCCA permits statistical analysis. The computer software calculates emphasis scores for 116 idea categories and 4 contextual scores. These scores are interval-level data and can be loaded into a statistical software package for quantitative analysis. (5) Problems with intercoder reliability that often plague hand-coded content analysis are avoided because the computer always applies the coding rules consistently. (6) Less work is required by the researchers at the beginning of a study involving the use of MCCA because the dictionary used during content analysis is already developed and built into the software. Despite being faced with limited resources, researchers can use these six advantages to quickly and reliably examine complex human/environment relationships through the analysis of large volumes of text.

Disadvantages of MCCA

Researchers who use MCCA should be aware of its four disadvantages. (1) It is often difficult to measure the qualitative attributes of phenomena within the social and natural sciences. There is a greater risk of developing invalid operational definitions when researchers use MCCA or other positivist approaches to help clarify the often speculative issues that exist at the interface of these two sciences. (2) Although MCCA is applicable to a wide range of social science issues, the dictionaries built into the software cannot be altered to fit special interests of the researcher. (3) More work is required at the end of the analysis because the researcher must return to the original text to help interpret the quantitative results. (4) Due to the open-ended nature of interviews, there often is a high level of variability among the scores calculated by MCCA. Table 1 displays the variance of c-scores that were calculated among the 81 visitor interviews. The variance levels ranged from 54.5 to 159.3. We minimized these four disadvantages in this study by going back to the original text and conducting a qualitative analysis. As a result, the validity of the study was strengthened.

CONCLUDING THOUGHTS

Human/environment concepts (e.g., leisure events) are complex and difficult to operationalize and measure when limited to either quantitative or qualitative approaches. Computer content analysis methods such as MCCA take advantage of the benefits afforded by both types of analysis. MCCA requires the collection of qualitative textual data (e.g., interview text). The program converts text into interval-level data for analysis in a highly reliable manner. The quantitative findings can be validated by returning to the original text, and the larger context of an issue can be examined. For these reasons, using MCCA can lead to quality studies while meeting many challenges faced by social scientists.

LITERATURE CITED

Henderson, K.A. 1991. **Dimensions of choice: a qualitative approach to recreation, parks, and leisure research**. State College, PA: Venture Publishing, Inc.

McTavish, D.G. 1997. **Scale validity: a computer content analysis approach**. Social Science Computer Review. 15(4): 379-393.

McTavish, D.G.; Pirro, E.B. 1990. **Contextual content analysis**. Quality and Quantity. 24: 245-265.

Pierskalla, C.D.; Lee, M.E. 1998. **An ecological perception model of leisure affordances**. Leisure Sciences. 20: 67-79.

Exploring the National Benefits of Alaska's Tongass National Forest

Stewart D. Allen, David N. Bengston, and David P. Fan[1]

Abstract.—A large sample of national news media stories about the Tongass National Forest—covering January 1, 1985, through July 31, 1997—was analyzed using the InfoTrend software and method. The main purpose of the analysis was to explore the national-level benefits and values reflected in news accounts about the Tongass. Results indicate that the nature of social debate about management of the Tongass was consistent over the 12-year period, focusing mainly on the clash between commodity-related benefits (timber harvest) and ecosystem benefits and values. Media discussion of recreation and moral/spiritual/aesthetic benefits and values lagged behind.

The Tongass is the Nation's largest national forest, consisting of nearly 17 million acres in southeast Alaska. The Tongass provides a variety of benefits for the 74,000 inhabitants of the region, including recreation; opportunities for employment and income; and subsistence gathering of fish, wildlife, and plants. Under the revised land management plan adopted in 1997, the Tongass National Forest has an active collaborative stewardship program that seeks new ways to work more closely with local communities.

As the largest remaining relatively unaltered coastal temperate rain forest in the world (Everest *et al.* 1997), the Tongass National Forest clearly has national and even global value. The more widespread benefits of the Tongass include recreation and tourism opportunities (present and future), provision of habitat and biodiversity, and the preservation values that accrue simply from its existence. Public lands in Alaska, in fact, are often cited as examples of resources having great value apart from human use.

The Forest Service has adopted an ecosystem-based approach to management of the national forests, which calls for understanding and articulation of the relevant attitudes, beliefs, and values of people who care about public lands (McCool *et al.* 1997). Collaborative stewardship provides a sound approach for understanding local communities. But what about the national public—how can Forest managers keep more in tune with their attitudes, beliefs, and values? We know that local or regional views and perceptions about natural resources and public land management may systematically differ from those of the national public (Steel *et al.* 1994).

National sentiments about the Tongass could be explored through survey research. However, national surveys are expensive, would likely be a low priority given declining budgets, and typically take a significant amount of time and effort to gain the approval required by the Paperwork Reduction Act. A recent ranking of possible research projects by Tongass managers and scientists rated a national survey far down the list, well below the amount of funding available.

Another option is through public involvement efforts, which help agencies identify national public values. However, the views of people who participate in public land planning efforts may differ systematically from those of people who do not participate (McCool *et al.* 1997), leaving many land managers wondering about the attitudes, beliefs, and values of the general public, especially national audiences. The Tongass received about 21,000 comments on its recent land management plan revision (USDA Forest Service 1996). But the vast majority of comments received were form letters or petitions, raising concerns that the public comment process may be strongly

[1] *U.S. Fish and Wildlife Service, Division of Refuges, 1011 E. Tudor, Anchorage, AK 99503 E-mail: stewart_allen@fws.gov; USDA Forest Service, North Central Research Station, 1992 Folwell Ave., St. Paul, MN 55108; Department of Genetics and Cell Biology, 250 Biological Sciences Building, University of Minnesota, St. Paul, MN 55108.*

influenced by a few special interests and may not accurately reflect the views of the broader public.

A new option for developing a better understanding of public attitudes, beliefs, and values, made feasible by online technology, is computer content analysis of mass media coverage specific to the topic at hand—in this case, the Tongass National Forest. Detjen (1995) cited a number of national surveys that found that about two-thirds of the public get most of their information about the environment from television and newspapers; he also noted that the public demand for coverage of environmental issues has increased substantially.

Content analysis has been widely used in the field of forestry and natural resources (Bengston and Xu 1995), but analysis has seldom focused on the mass media. Content analyses of the news media have produced results consistently similar to findings of surveys and opinion polls (Bengston *et al.* 1999).

This study used content analysis of a large sample of national news media stories to explore the national benefits associated with the Tongass National Forest. Because the news media appear to accurately reflect social debate about natural resource issues, coverage of the Tongass should provide insight into the perceptions and values of the national public.

DATA AND METHODOLOGY

The Tongass study took advantage of a similar study undertaken to explore media coverage of the Forest Service and the national forests nationwide (Fan and Bengston 1997). Applying the content analysis procedures used in that earlier study allowed us to collect and analyze the data very efficiently—the results were delivered in less than 2 months. Like the national effort, the Tongass study focused on four categories of benefits associated with management of national forests:

- *Recreation Benefits* reflect the values of the Tongass for recreational use. Following national trends, visits to the Tongass have increased dramatically in recent years, due in large part to the burgeoning cruise ship industry which, in the summer of 1998, brought nearly 600,000 visitors to Juneau alone.

- *Timber Commodity Benefits* reflect the value of the Tongass to provide commodities desired by society. On the Tongass, this is primarily timber, which has always been the most contentious issue for forest managers.

- *Ecological Benefits* reflect the value of the Tongass as a functioning ecosystem that provides habitat for many species and a variety of life-supporting functions for humans.

- *Moral/Spiritual/Aesthetic Benefits* reflect the value of the Tongass as a place that provides scenic beauty, opportunities for spiritual renewal, a natural heritage to pass on to future generations, and a vast expanse of land and water that exists and has value apart from its use by humans.

The analysis involved four main steps: (1) downloading news media stories about the Tongass National Forest from an online commercial database; (2) filtering the text to eliminate irrelevant paragraphs; (3) developing and refining computer instructions to score the remaining text for the concepts of interest (i.e., the four benefit categories); and (4) checking the validity of the analysis. Each step is briefly described below.

1. Downloading news media stories

Stories discussing the Tongass National Forest were downloaded from the NEXIS online commercial database using the search command (tongass or ((southeast! alaska!) w/p forest)) from January 1, 1985 through July 31, 1997. The exclamation points in the search command meant that any trailing letters were permitted, and the w/p meant that a phrase referring to southeast Alaska had to be within the same paragraph as the word "forest." Therefore, this search found all stories referring either to the Tongass National Forest or to forests in southeastern Alaska.

The following news sources were included in this analysis: Associated Press, Chicago Tribune, Christian Science Monitor, Los Angeles Times, MacNeil-Lehrer Newshour, New York

Times, Southern News Service, States News Service, United Press International (both the State and national wires), and the Washington Post. The full texts of these news sources were all available in NEXIS for the entire time period of the study. These news sources contained 788 stories about the Tongass over the period January 1, 1985, through July 31, 1997, and text from all 788 stories was downloaded for analysis. Only text within 100 words of the search command—50 words on either side—was downloaded. This greatly reduced the amount of irrelevant text that would have been retrieved from stories that mentioned the Tongass only in passing.

2. Filtering text

The retrieved text was analyzed using the patented InfoTrend method and computer software (Fan 1990, 1994, 1997). The InfoTrend software can discard paragraphs that do not fit with user-specified criteria. In this study, paragraphs were discarded that did not discuss the Tongass National Forest or that mentioned the Tongass only incidentally (e.g., stories about two Native Alaskan teenagers who were banished to a remote area as punishment for a crime). The focusing of text through filtration greatly simplifies and improves the accuracy of computer coding.

3. Scoring paragraphs

InfoTrend computer instructions were developed to score the remaining paragraphs for each of the concepts of interest, i.e., to count the number of times each of the concepts was expressed in the database of news media text about the Tongass. This involved developing a set of *dictionaries* related to each concept (i.e., groups of words and phrases associated with each category) and a series of computer instructions that specify how the dictionaries are combined to identify the concepts. For example, one set of computer instructions specified that words and phrases with the connotation of *ecological objects* (e.g., aquatic, animals, fauna, flora, ecosystem, habitat, riparian, species, wetland, wilderness) appearing in the same paragraph as words expressing the idea *ecological damage* (e.g., collapse, decimate, decline, degrade, fragment, imperiled, shrinking, unravel, vanishing) combined to create the new meaning of concern over *ecological damage*, which was one of the dimensions of the concept *Ecological Benefits*. An example of news media text that was coded using this set of computer instructions is:

> "The Tongass ecosystem is collapsing," said SEACC Executive Director John Sisk. "No environmental group is going to sit around and watch wildlife populations disappear." (States News Service, 12/28/92).

In this example, "ecosystem'" and "wildlife" were coded as *ecological object* and "collapsing" and "disappear" were coded as *ecological damage*. Therefore, this paragraph was coded as an expression of the concept *Ecological Benefits*.

As another example, computer instructions specified that words or phrases with the connotation of *timber commodity* (e.g., board feet, board-feet, clearcut, forest products, logging, lumber, sawlogs, stumpage, timberlands, wood products) appearing within 50 characters of words or phrases of the connotation *job concern* (e.g., community stability, employment, jobs, labor, laid-off, layoffs, local economy, paycheck, wages, working people) combined to create the new meaning of concern about *timber industry jobs*, which was one of the dimensions of the concept *Timber Commodity Benefits*. An example of news media text that was coded using this set of computer instructions is:

> "The leisure lobby now wants to go back on its word," said Young, who argued that the guarantees are necessary to preserve some 6,000 timber-related jobs in southeast Alaska. (The Associated Press 7/28/88).

In this example, "timber" was coded as *timber commodity* and "jobs" was coded as *job concern*. This paragraph was therefore coded as an expression of the concept *Timber Commodity Benefits*. Similar computer instructions were developed to identify and count expressions of each of the other concepts of interest.

4. Checking validity

After the content analysis computer instructions were developed and refined, a formal

validity analysis was carried out. A content analysis variable is valid to the extent that it measures the concept it was intended to measure (Weber 1990). We examined random samples of several hundred stories that were coded using our computer instructions so that we could determine if our instructions were able to identify expressions of the concepts of interest at least 80 percent of the time—a rule of thumb sometimes used in content analysis. After final refinements in the computer instructions, the accuracy rates were all greater than 80 percent.

DISCUSSION OF FINDINGS

The results demonstrate that the nature of social debate about management of the Tongass was consistent over the 12-year study period, focusing mainly on the clash between timber harvest and ecosystem benefits (fig. 1).[2] Media discussion of recreation and moral/spiritual/aesthetic benefits lagged behind, with greater attention paid to recreation.

Perhaps the biggest difference between the Tongass-specific analysis and the nationwide analysis conducted by Fan and Bengston (1997) is the extreme peaks and valleys evident in the Tongass data. This is not unexpected given the much smaller sample in this study (788 articles compared to about 28,000). This difference made it difficult to assess trends in coverage for the Tongass, but it was clear that less attention was given to recreational benefits of the Tongass compared with Fan and Bengston's (1997) nationwide analysis, with little increase in coverage of recreational issues evident. This makes sense because few people have visited the Tongass, which is remote and difficult to access for most people. Media coverage of all national forests, on the other

[2] *The downturn in the number of paragraphs expressing each one of the concepts in figures 1 through 3 is due to the fact that our text database extended only through July 31, 1997. The results for 1997 should therefore be interpreted with great caution.*

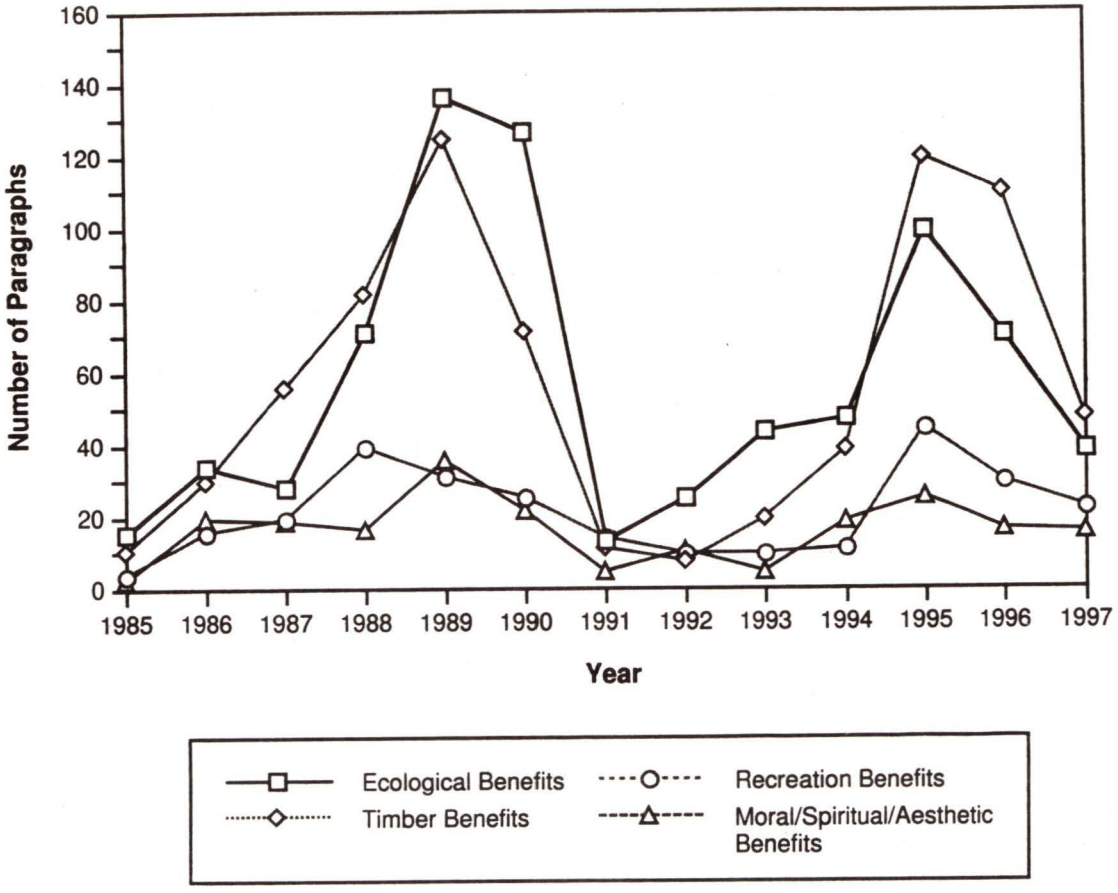


Figure 1.—*Number of news media paragraphs expressing four categories of benefits associated with the Tongass National Forest, 1985-1997.*

hand, would be expected to deal more with local Forests, where recreation is typically the dominant use.

Coverage peaked in years surrounding events deemed worthy of national attention. The first of these peaks occurred just before 1990, when Congress passed the Tongass Timber Reform Act in response to concern over clearcutting on the Forest. The subsequent peak in coverage in the mid-1990's reflects national attention on the Forest Service's ongoing revision of the Tongass land management plan, with media discussion again highlighting timber harvest and ecosystem values. This time, however, more attention was paid to timber than to ecological benefits. This finding was surprising and contrary to the nationwide analysis that showed diminishing discussion of commodity benefits from 1992 to 1996 and increasing discussion of recreation and moral/spiritual/aesthetic benefits (Fan and Bengston 1997). Opinion polls also have tended to show a change in public values about the management of public lands, from a commodity orientation to one more grounded in recreation (McCool *et al.* 1997).

The timber lobby may simply have been more effective than the environmental lobby in obtaining coverage in the mid-1990's, but we also searched for other explanations. Analysis of the coding of *Timber Commodity Benefits* statements suggested that these were more complex. Re-analysis of the coding rules for *Timber Commodity Benefits* may lead us to separate these statements into more than one category.

Subsequent analyses probed deeper into the nature of opposition to timber harvest as portrayed in the media. During the 1990 peak in coverage, opposition appeared to be based equally on perceptions of environmental damage and of concern over subsidies being provided to the timber industry (fig. 2). In the mid-1990's, this pattern changed, with greater concern over the environmental effects and less over subsidies. This peak in news media discussion barely preceded national discussion of a new roads policy announced by the Forest Service, with a moratorium on new road building in unroaded areas—except on the Tongass and a few other areas.

We also were interested in how the media portrayed the Forest Service stewardship of the Tongass, and used the computer instructions and dictionaries developed by Bengston and Fan (1999) to analyze this issue. Overall, the Forest Service's stewardship of the Tongass was portrayed more positively than negatively,

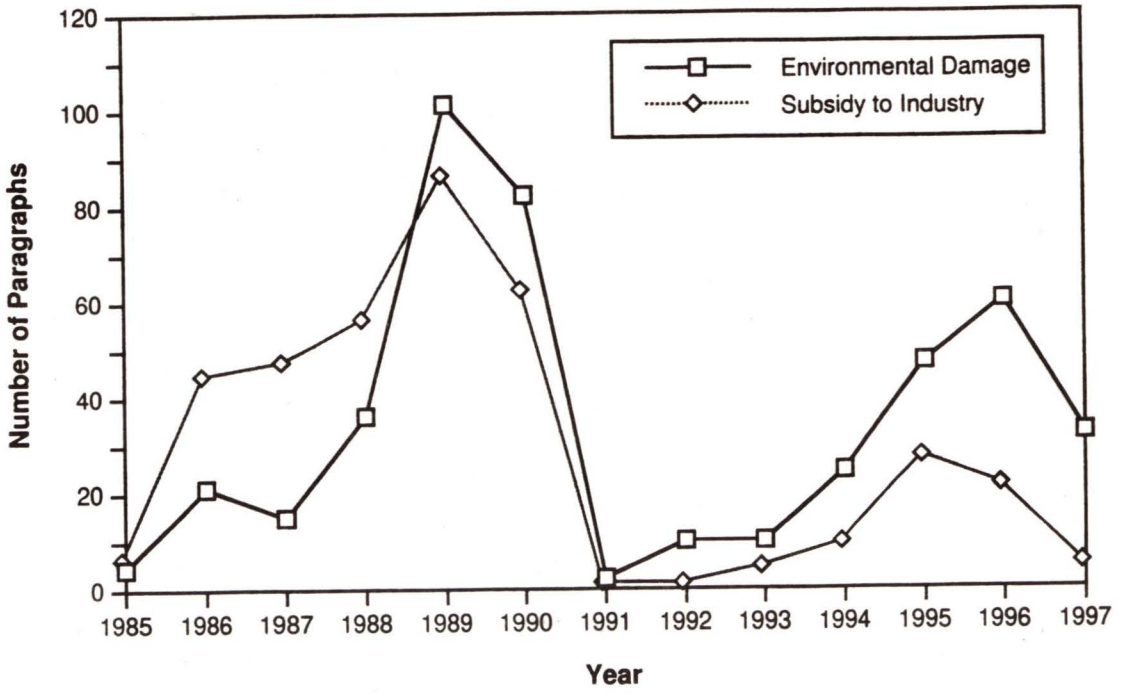


Figure 2.—*Number of news media paragraphs expressing the views that timber harvesting is environmentally damaging and that subsidies are being provided to the timber industry, 1985-1997.*

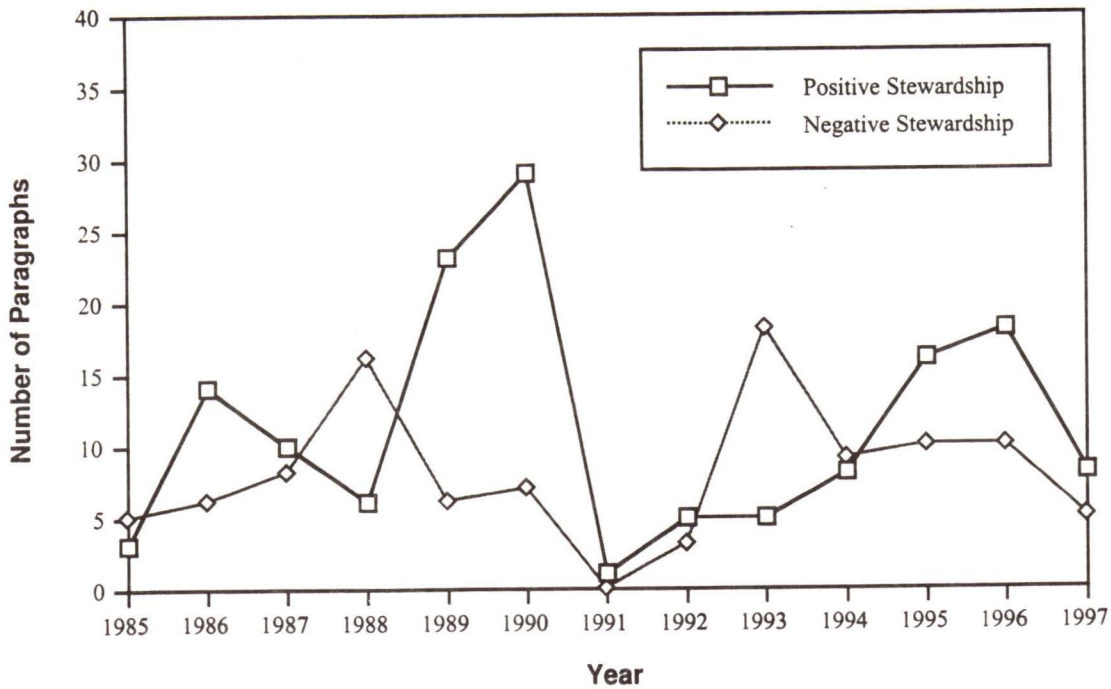


Figure 3.—*Number of news media paragraphs expressing positive and negative attitudes toward the Forest Service's stewardship of the Tongass National Forest, 1985-1997.*

although coverage of the issue was fairly low. The results showed an interesting pattern first of negative coverage of the agency's stewardship, followed by a peak in positive coverage (fig. 3). The highest peak, in fact, followed passage of the Tongass Timber Reform Act. Perhaps the agency also had a role, effectively responding to initially negative coverage. These findings demonstrate the importance of timing in conducting opinion polls, suggesting, for example, that results may have differed in 1988 and 1990.

Using the Bengston and Fan (1999) computer instructions, we also analyzed media discussion of the Forest Service's use of collaboration with Tongass stakeholders and the agency's use of science in managing the Forest. We found far more positive than negative discussion of collaboration and science-based management (although in both cases the total amount of coverage was very low).

CONCLUDING REMARKS

The findings indicate the value of content analysis of online media coverage as a means of identifying trends in public perceptions of benefits regarding Forest management—not just for the entire National Forest System, but for individual Forests. This method allows analysis of trends over various time periods and for various topics. It is perhaps the ultimate in adaptive research, because one can change the analysis given initial findings, e.g. expand the set of topics explored, refine the concepts under investigation. The method can be a highly efficient means of addressing complex issues with broad publics and can be tailored to the immediate need.

Tongass land managers have expressed interest in applying the data for a number of uses. For example, the Forest's public affairs office plans to use the data to help develop a national communication strategy for the Tongass. Knowing the extent and nature of existing and past coverage is extremely valuable in designing an effective strategy. The results also counter the perception of many agency employees (and many members of the public) that all news is bad news and that the agency is only reviled by the press. The results can also be compared to conclusions based on public comments or can be used to assess the impact of news events on public perceptions. When supplemented with data from other sources, content analysis of the news media is a valuable tool in forest planning and management.

LITERATURE CITED

Bengston, David N.; Xu, Zhi. 1995. **Changing National Forest values: a content analysis**. Res. Pap. NC-323. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 29 p.

Bengston, David N.; Fan, David P. 1999. **An innovative method for evaluating strategic goals in a public agency: conservation leadership in the U.S. Forest Service**. Evaluation Review. 23(1): 77-100.

Bengston, David N.; Fan, David P.; Celarier, Doris N. 1999. **Monitoring the social environment for natural resource management and policy: the case of U.S. National Forest benefits and values**. Journal of Environmental Management. 56: 181-193.

Detjen, Jim. 1995. **The media's role in science education**. BioScience. Supplement p. S-58ff.

Everest, Fred H.; Swanston, Douglas N.; Shaw, III, Charles G.; Smith, Winston P.; Julin, Kent R.; Allen, Stewart D. 1997. **Evaluation of the use of scientific information in developing the 1997 forest plan for the Tongass National Forest**. Gen. Tech. Rep. PNW-415. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 69 p. (Shaw, Charles G. III, tech. coord.; Conservation and resource assessments for the Tongass land management plan revision).

Fan, David P. 1990. **Information processing expert system for text analysis and predicting public opinion based on information available to the public**. U.S. Patent 4,930,077.

Fan, David P. 1994. **Information processing analysis system for sorting and scoring text**. U.S. Patent 5, 371,673.

Fan, David P. 1997. **Computer content analysis of press coverage and prediction of public opinion for the 1995 sovereignty referendum in Quebec**. Social Science Computer Review. 15(4): 351-366.

Fan, David P.; Bengston, David N. 1997. **Public debates shaping forestry's future: an analysis**. Report prepared for USDA Forest Service, Office of Communications, Washington, DC.

McCool, Stephen F.; Burchfield, James A.; Allen, Stewart D. 1997 (Volume IV). Chapter 7: **Social assessment**. In: Quigley, Thomas M.; Arbelbide, Sylvia J., tech. eds. An assessment of ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 4 vol. (Quigley, Thomas M., tech. ed.; The Interior Columbia Basin Ecosystem Management Project: Scientific Assessment).

Steel, Brent; List, Peter; Shindler, Bruce. 1994. **Conflicting values about federal forests: a comparison of national and Oregon publics**. Society and Natural Resources. 7: 137-153.

USDA Forest Service. 1996. **Analysis of public comment for the Tongass land management plan revision**. Revised Supplement to the Draft Environmental Impact Statement and Forest Plan. Juneau, AK: USDA Forest Service, Alaska Regional Office.

Weber, R.P. 1990. **Basic content analysis**, 2d ed. Newbury Park, CA: Sage Publications. 96 p.

Applying the VBPro Computer Programs to Analysis of Environmental Policy Debates: Comparing Stakeholder Frames

Bonnie P. Riechert[1]

Abstract.—Environmental issues ideally lend themselves to studies of selective framing on news media content. Environmental conflicts often are complex enough to support a variety of interpretations or emphases, which may be studied as distinct perspectives or frames co-existing and competing for dominance in the discourse of the public and of the news media. The VBMap program for multidimensional scaling analysis, one of the computer-assisted content analysis programs in the VBPro set of programs, was used to analyze text of news articles and stakeholder news releases related to the topics of wetlands and timber salvage. The sets of full-text news releases and news articles were obtained from AP News and PR Newswire through the DIALOG online information service. The studies demonstrate the usefulness of the procedures in investigating public opinion and news coverage relating to controversial policy issues.

Analysis of communication dynamics involved in public opinion and policy development is relevant to social scientists, State and national leaders, and a range of groups with varying stakes in complex issues such as natural resources management. In any particular public issue, multiple stakeholders often become involved in advocating their perspective. Special interest groups actively engage in writing and sending out news releases that promote their opinion on the issue(s) salient to them. Essentially, they compete to get their viewpoints represented in the mass news media.

Traditional content analysis of text such as news releases generated by special news media and issue coverage in the news media has inherent limitations with regard to reliability and feasible data size. This paper describes the application of computer-assisted content analysis of issue framing by stakeholders and in news coverage using VBPro, a set of computer programs including VBMap for multidimensional scaling (MDS). The programs, developed by Miller, are available without charge on the World Wide Web.[2]

The multidimensional scaling capabilities of the VBMap program enable scientists to examine huge sets of text for patterns of word co-occurrences. This type of analysis has been applied by the author and others to investigate themes and frames in text. Frame mapping offers researchers a way of identifying key themes in text by different stakeholder groups and of comparing the relative representation of the different frames in news media coverage. Accordingly, studies by the author build on the description of framing as selective representation (Entman 1991, 1993) by providing a methodological tool that is powerful, precise, and reliable. The output files of the VBPro programs can be used with popular statistical analysis packages such as SPSS® or SAS® for conducting statistical tests.

DATA AND METHODOLOGY

The PR Newswire database was the source of 102 news releases from divergent special interest groups involved in the issue of conservation and regulation of wetlands. The releases included 58 from conservation groups such as the National Audubon Society, as well as 44 from property-owner advocacy groups such as the American Farm Bureau Federation. The two sets of releases were analyzed for distinct word co-occurrences using the concept mapping procedures described by Miller (1995,

[1] *Coordinator of Communications, The University of Tennessee Agricultural Experiment Station, P.O. Box 1071, Knoxville, TN 37901-1071. E-mail: bonnieriechert@utk.edu*

[2] *The programs and their user manuals are available at: http://excellent.com.utk.edu/~mmmiller/vbpro*

1997) and Riechert (1996).[3] The methods, developed by Miller (1995) and Riechert, employ multidimensional scaling and cluster analysis to identify patterns of word co-occurence in the text.

FINDINGS

Terms were identified as best representing the issue frame or selective issue representation by each of the two special interest groups. When discussing wetlands, conservationists frequently use the following terms: *river, natural, wildlife, species, conservation, watershed, Everglades, endangered, society, project, protect, bird, bay, acres, threatened, birds, habitat, fish, ecosystem, migratory, ecosystems, area, rare, earth, forests, preserve, restore, research,* and *protected.*

In contrast, when property-owner advocates discuss the wetlands issue, they emphasize a different set of terms: *farm, farmers, property, rights, agriculture, regulations, legislation, private, landowners, compensation, agencies, support, legislative, wetland, statewide, definition, agricultural, owners, ranchers, supports, balance, court, issue, state, congressional, business, laws,* and *law.* The very words chosen by different stakeholders in a contentious issue indicate their differential selective emphasis of distinct aspects of a complex issue.

The validity of the two selected sets of terms to represent one of the advocacy group frames is indicated in two-tailed t -tests. For Conservation Frame terms, the mean occurrence is 16.76 in conservationist news releases and 2.16 in property-owner news releases ($t = 6.58$, 100 df, $p < .0001$). For Property-Owner terms, the mean occurrence is 4.64 in conservationist news releases and 30.25 in property-owner news releases ($t = -9.78$, 100 df, $p < .0001$). The two sets of frame terms then were used to compare frame prominence in news coverage and examine shifts over time. Researchers can conveniently access such comparisons by submitting the news articles, coded by year published, to the VBPro search procedure. The full text of 1,465 news articles about U.S. wetlands were used in the analysis. The full text of the articles distributed by Associated Press from July 1984 through June 1995 were obtained from the AP Newswire database.

Comparisons in news coverage from 1984 to 1995, using the two sets of frame terms in searches, reveal that the Conservation Frame received more prominence in the news media from 1984 until 1990-1991, and the Property-Owner Frame was represented more prominently in the news from then on. Such a trend suggests further examination into the news media content to determine whether this shift can be related to a shift in types of persons quoted in the news.

In ongoing studies, the author is also applying these methods to comparing the industry and conservation frames relative to the controversies surrounding the 1995 Emergency Salvage Timber Rider. Analysis of the news releases from timber industry groups and the conservationist groups confirmed that the two sets of stakeholders use different words to discuss the timber salvage issue. As would be expected, the conservation groups placed emphasis on the environmental aspects of the issue, stressing preservation of the *ancient* and *wild* forests from the *damage* caused by *logging.* Frequently used terms emphasized environmental aspects such as *owl, tree, fish,* and *clearcut.* In contrast, the industry groups promoted the business aspect of the issue, using words relating to the timber communities' economy, such as *rural, communities, dependent,* and *provisions.* They discussed *harvesting* rather than *clearcutting.*

CONCLUDING REMARKS

The comparisons reported here illustrate the usefulness of the VBPro programs and the Frame Mapping method for investigating divergent stakeholder frames engaged in competing policy issues. Benefits of using VBPro in content analysis include the ability to examine large amounts of text and to precisely measure the occurrence of terms, and meaningful sets of terms, of interest. This can enable the researcher to study any number of theoretical and empirical relationships of interest.

ACKNOWLEDGMENTS

The author thanks the USDA Forest Service, North Central Research Station, for funding assistance in some of the studies described here.

[3] *See also Miller* et al. *(1998), Miller and Riechert (2000a, 2000b), and Riechert and Miller (1997).*

LITERATURE CITED

Entman, R.M. 1991. **Framing U.S. coverage of international news: contrasts in narratives of the KAL and Iran Air incidents**. Journal of Communication. 41(4): 6-29.

Entman, R.M. 1993. **Framing: toward clarification of a fractured paradigm**. Journal of Communication. 43(4): 51-58.

Miller, M.M. 1995. **User's guide for VBMap: a program for multidimensional scaling of concepts**. Knoxville, TN: The University of Tennessee.

Miller, M.M. 1997. **Frame mapping and analysis of news coverage of contentious issues**. Social Science Computing Review. 15(4): 367-378.

Miller, M.M.; Andsager, J.L.; Riechert, B.P. 1998. **Framing the candidates in national primaries: issues and images**. Journalism and Mass Communication Quarterly. 74: 312-324.

Miller, M.M.; Riechert, B.P. 2000a. **Frame mapping: a new method for investigating issues**. In: West, Mark D., ed. Applications of computer content analysis. Norwood, NJ: Ablex (Progress in Communication Sciences Series). (in press).

Miller, M.M.; Riechert, B.P. 2000b. **Interest group strategies and journalistic norms: news media framing of environmental issues**. In: Allen, S.; Adam, B.; Carter, C., eds. The media politics of environmental risk. New York: Routledge. (in press).

Riechert, B.P. 1996. **Advocacy group and news media framing of public policy issues: frame mapping the wetlands debates**. Knoxville, TN: The University of Tennessee. Unpublished doctoral dissertation.

Riechert, B.P.; Miller, M.M. 1997. **Identifying themes and frames in text on pesticides, wetlands, and forest salvage**. In: Proceedings, Conference on communication and environment. Syracuse, NY: State University of New York, College of Environmental Science and Forestry: 96-106.

Messages in Global Climate Change: Using the Diction Program to Analyze News Coverage

James Shanahan[1]

Abstract.—This paper demonstrates a use of the computer program Diction 4.0[2] for analyzing newspaper reports on global climate change. Diction was developed by Roderick P. Hart of the University of Texas. The purpose of this paper is (1) to track shifts and changes in "message" across the years 1988-1997 and (2) to demonstrate how the Diction program can be used. In particular, we show how computer-aided content analysis can be combined with traditional human-coded content analysis to facilitate triangulation of findings. We use Diction to examine selected aspects of messages that appeared across a selected span of climate change coverage in national newspapers. We then combine these results with data from earlier human-coded analyses of climate change. The analyses help us converge on a more reliable interpretation of what happened in the "ups and downs" of global climate change coverage.

As this volume demonstrates, there has been an explosion in the number of programs available for computer-aided content analysis of textual material. Programs such as VBPro, TextPack, and others have long made textual analysis relatively easy for those with basic computer skills. Along with the arrival of a variety of programs facilitating computer analysis of qualitative data (for instance, QualPro, NUD•IST), there are now available various "plug and play" data analysis tools, which mean that more researchers, regulators, and practitioners can have access to these techniques than ever before (Weitzman and Miles 1995).

This growth in the availability of tools has benefits and drawbacks. The benefits are obvious, in that potentially useful tools are more widely and democratically available; there is increased analytic power available at low cost. The main drawback is that researchers may not fully understand the theories and procedures upon which the programs are developed; this can result in facile analysis and perhaps misleading results.

In this paper, we present some results using the program Diction 4.0. Diction was developed by Roderick P. Hart, a leading rhetorical scholar who is very interested in U.S. Presidential speech (Hart 1985, 1995). The program is based on the idea that word frequencies can help an analyst understand the meaning of a text. This frequency analysis is usually done with the aid of a "dictionary." Weber notes that conceptual dictionaries consist of "category names, the definitions or rules for assigning words to categories, and the actual assignment of specific words," (Weber 1985, p. 25). Some early examples were the Harvard IV Psychosocial dictionaries and the Lasswell Value Dictionary.

Diction creates more than 30 dictionaries assessing concepts such as "tenacity," "collectives," "ambivalence," and others. For instance, the dictionary for the concept of "communication" contains dozens of words such as "advise," "ballyhoo," "chat," and "debate." Diction counts the frequency of such words in a text and compares the frequency to what is found in "standard" or "normal" texts. Thus,

---

[1] *Department of Communication, 314 Kennedy Hall, Cornell University, Ithaca, NY 14853. E-mail: jes30@cornell.edu.* *Thanks to Heather Farquhar and Katherine McComas, who assisted with data-gathering.*

[2] *The promotional materials at the Sage Publications web site say that "Diction 4.0 is a scientific method for determining the tone of a verbal message using a powerful language analysis software program that searches a passage for five general features as well as 35 sub-features. It can process an unlimited number of texts using a 10,000 word search corpus. Diction 4.0 produces written reports about the texts it processes and also writes the results to numeric files for later statistical analysis" (http://www.sagepub.com/sagepage/Diction.htm)*

one can tell whether research texts are "higher" or "lower" on a given concept than what would be expected by chance (results are reported as standard deviations against a mean). Also, Diction yields numeric databases for further statistical processing, which is an important feature as will be seen later in this paper.

The construction of these dictionaries is obviously of key importance, because it corresponds to the human coding element of traditional content analysis. Once words are assigned to a dictionary, they will forevermore be counted as an exemplar of whatever particular concept group they are assigned to. If this process is flawed, the program will not be very useful and may generate erroneous conclusions. Thus, researchers using a particular program should pay careful attention to how the dictionaries are constructed.

Diction's dictionaries are especially useful for analysis of political and ideological speech or text. Hart's own original interest in Presidential rhetoric has yielded a tool well suited to analysis of sociopolitical material. For the present purposes, which are analyses of press statements about global climate change (obviously an issue with social and political overtones), Diction proved to be very helpful.

Over the years, numerous scholars have commented on phenomena associated with press coverage of global warming (alternately termed the "greenhouse effect" or "global climate change"). Studies have offered several hypotheses about why coverage of the issue has gone through a variety of phases (e.g., Hilgartner and Bosk 1988, Mazur and Lee 1993, Trumbo 1994, Ungar 1992).

By the early 1990's, scholars (and others) had become aware that the huge amount of press and public interest that had built up in the preceding years had dissipated rather quickly. This motivated attention among a number of researchers to seek hypotheses and reasons as to why attention faded so rapidly. "Global warming" quickly was seized on as an archetypal case of a scientific problem connected to a social issue; it provided the best possible fodder for media theorists' and social movement scholars' thinking about the relationships between media and the environment in the 1990's.

Even better, global climate change seemed to uphold Anthony Downs' classic notion of the "issue-attention cycle" (Downs 1972), which argues that environmental issues will get public attention only for short periods. Thus, armed with both theory and very recent data, scholars moved very quickly into analyzing global warming press coverage.

Approaches have varied, from strictly qualitative hypothetical examinations to quantitative content analyses. Papers and even books on the topic continue to appear (e.g., Shanahan and McComas 1999). But as the issue continues to prolong itself, the old explanations do not work as well. For instance, the "up and down" in coverage from 1988-1992 seemed to fit well with the notion of a Downsian cycle that played itself out, perhaps never to reappear. However, in the years since 1995, attention to climate change has again risen; the cycle has apparently come back. One factor is the reappearance of El Niño in Pacific waters, which has brought the kind of crazy weather that always motivates news attention.

Because coverage of global climate change is dynamic and subject to many forces, we continue to maintain an interest in the topic, even as some scholars may be turning to other issues. Our project maintains an archive of materials related to global climate change, and we continue to add to this database. Currently, our data-gathering efforts have brought us up to 1997. Much of our archive consists of materials written in national newspapers such as the *New York Times* and the *Washington Post* (and other newspapers), but we have also been collecting materials from public relations sources such as the Western Fuels Institute.

This paper reports some findings from the archive. In particular, we try to look a little more deeply into news coverage of global climate change than the average quantitative study, using tools and techniques of quantitative content analysis in some unique ways.

TONE OF GLOBAL WARMING COVERAGE

We have nearly 600 articles archived in a full-text database of global warming stories from the *Times* and the *Post*. To make use of the full-text availability, we performed computer-aided content analyses on these sources.

Further, because we had done human-coded content analyses on many of these same articles (McComas and Shanahan 1999), we were able to triangulate computer-coded analyses against some of our earlier analyses, to help us confirm or deny conclusions reached in earlier studies.

For our purposes, Diction permitted exploration of a large body of text, in comparison to more interpretive explanations we had reached through our human-coded content analysis. The advantage of computer-coded analysis is that reliability is perfect; the disadvantage is that context can be lost. However, triangulating computer-aided analyses against human-coded efforts may offer the best of both worlds.

Our first analysis looks at the issue of "certainty" in global climate change coverage. We have argued that early stories in the cycle presented a fairly "certain" portrayal of global warming. We argue that narratives presenting impending disasters need to be seen as likely-to-occur, otherwise the public will dismiss the claims as shrill. Further, we argue that the increasing appearance of uncertainty on the issue served as a mechanism to continue driving the narrative after the disaster claims had "worn out." Thus, in our human-coded analysis, we interpreted articles as becoming less certain over time.

Diction measures "certainty" by counting words indicating "resoluteness, inflexibility, and completeness" (Hart 1995, p. 45). Using this dictionary, we hypothesized that the frequency of use of "certain" terms would decline across the span of coverage.

This hypothesis was supported. From our overall *Times* and *Post* database of nearly 600 articles, we randomly sampled about 10 percent of the articles and submitted the full texts to computer-coded content analysis. We found a negative correlation between the number of "certain" terms used in the article and the date of publication of the article ($r = -.29$, $p < .05$) (fig. 1). Thus, language reflecting certainty tended to be at its high earliest in the coverage (we also tested nonlinear correlations, but these did not explain significantly more variance). Thus, a Diction analysis lending support to a previously hypothesized and observed human-coded relationship gives convergent support to the theory.

A number of other correlations of interest appeared in the course of our analysis, although we had not hypothesized these relationships. For instance, "numeric" terms increased in frequency over the course of the coverage ($r = .237$, $p < .05$). "Blame" terms also increased in frequency ($r = .362$, $p < .05$). "Optimism" terms decreased, despite the decrease in

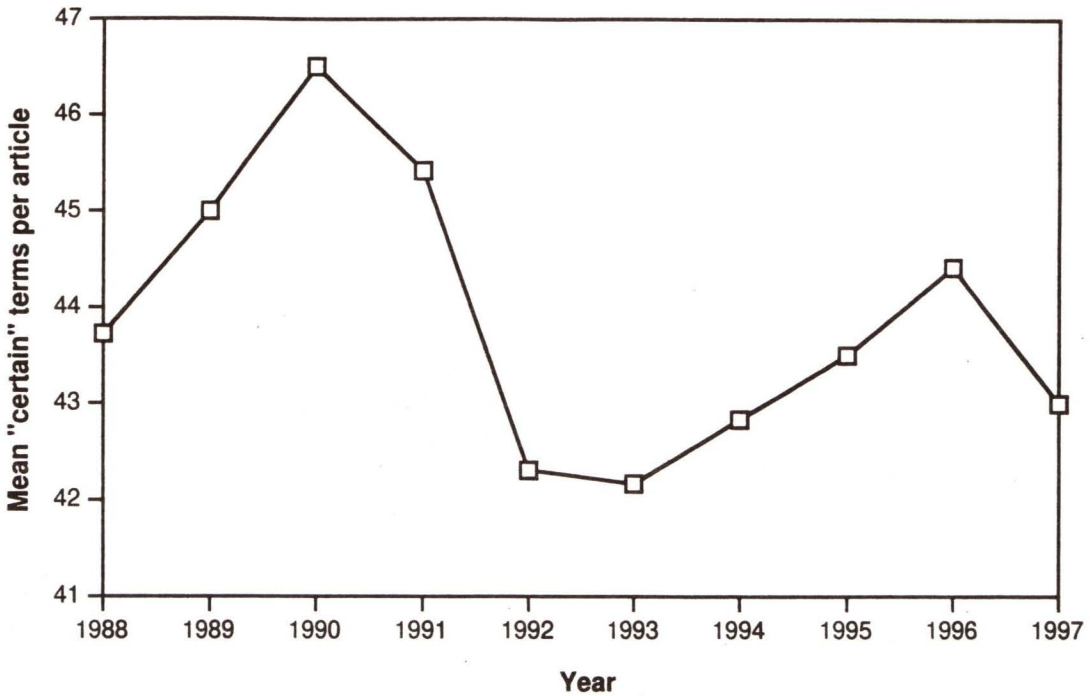


Figure 1.—*Frequency of terms reflecting the idea of "certainty" in global climate change coverage, by date (r = -.29).*

certainty observed earlier ($r = -.321$, $p < .05$). These relationships raise a number of interesting suggestions about how the tone and character of the coverage changed over the years. These observations can be brought to bear when we return to human-coded analyses and interpretations to help discover mechanisms that might drive coverage as well as reception and understanding of that coverage.

We also used Diction to help characterize specific text that we had already categorized, using an interpretive scheme putting stories into various themes. For instance, in our human-coded analyses, if we felt that "new evidence or research" was the main theme of a story, we characterized it as such. Using themes, we were then able to explore the linguistic dimensions of the stories we had identified using those themes.

Our "new evidence or research" theme was positively related to "motion" words ($r = .312$, $p < .05$), especially motion associated with physical processes (as would be expected, since climate change coverage often discusses circulation, movement, etc.). But the theme was negatively related to words focusing on "accomplishment," suggesting that new research studies may have been presented as somewhat incomplete or uncertain, compared to other stories in our database. This may conflict somewhat with the notion that certainty was highest at the early point of the coverage, because this was also the time when new research stories were most prominent. However, it may simply be that early certainty in coverage was due to non-research-oriented stories.

Stories categorized as dealing with the theme "general science and background" were lower in language expressing the idea "collectives" ($r = -.512$, $p < .05$), which are "singular nouns connoting plurality that function to decrease specificity" (Hart 1995, p. 45). Also, they were higher in "diversity" words, indicating individuals and institutions manifesting differences from norms ($r = .41$, $p < .05$), and there were more "liberation" words, indicating terms maximizing individual choice. These findings suggest that science was presented as open, fluid, dynamic, and unsettled.

Across the database, stories focusing on the theme "consequences" contained more "ambivalence" ($r = .312$, $p < .05$). This connects with the findings on certainty. Also, as would be expected, stories focusing on the consequences of global warming contained more "hardship" terms ($r=.32$, $p < .05$) and fewer "optimistic" terms ($r = -.33$, $p < .05$).

Finally, stories focusing on the theme "economics and the cost of the solution" were more "ambivalent" than other stories and contained more "hardship" terms and more terms of "aggression." Also, they contained fewer "optimistic" terms and more terms dealing with "common" issues. Both the "consequences" and "economics" stories manifest word-count profiles that would be expected via common sense.

DISCUSSION

Analyses such as these show how computer-aided text analysis programs such as Diction can be used in a broader program of content analytic research. On their own, such programs do not constitute the be-all and end-all of research. Although computer programs are convenient and help solve reliability problems, in the end they are nothing more than devices that automate what is a human coding decision at some level.

However, used in conjunction with standard content analytic practice, computer methods offer great promise in helping to formulate and confirm theory. In this paper, we showed first how a computer analysis helped us to confirm theory. The later analyses show suggestive results that might help to formulate theory.

In this way, researchers can use computer and human coding procedures cyclically, using one to confirm or disconfirm results obtained with the other method. Our data on the tone of global warming coverage tend to confirm our earlier findings. Although word-count frequencies should not be overinterpreted, the findings are generally consistent with our earlier view of the global warming coverage cycle as an issue that became less certain over time, reflecting a narrative move from established science to dynamic controversy. Insofar as our data extend now into 1997, well past the completion of the first cycle, it seems safe to claim that the new stories appearing about global warming accept this controversy as a narrative foundation.

The further findings on relationships between theme and word counts will help us go back to particular texts when looking for key examples that might explain why people react to certain coverage as they do. For instance, the finding that stories focusing on consequences were more ambivalent than other stories may help us understand how public opinion moved away from unilateral support for immediate action to control climate change.

ACKNOWLEDGMENTS

Thanks to Heather Farquhar and Katherine McComas, who assisted with data gathering.

LITERATURE CITED

Downs, A. 1972. **Up and down with ecology—the "issue attention cycle."** The Public Interest. 28: 38-50.

Hart, R.P. 1985. **Systemic analysis of political discourse: the development of DICTION**. In: Sanders, K. *et al.*, eds. Political communication yearbook: 1984. Carbondale, IL: Southern Illinois University Press: 97-134.

Hart, R.P. 1995. **Diction 4.0 (user's manual)**. Thousand Oaks, CA: Scolari.

Hilgartner, S.; Bosk, C. 1988. **The rise and fall of social problems: a public arenas model**. American Journal of Sociology. 94(1): 53-78.

Mazur, A.; Lee, J. 1993. **Sounding the global alarm: environmental issues in the US national news**. Social Studies of Science. 23: 681-720.

McComas, K.; Shanahan, J. 1999. **Telling stories about global climate change: measuring the impact of narratives on issue cycles**. Communication Research. 26(1):30-57.

Shanahan, J.; McComas, K. 1999. **Nature stories: depictions of the environment and their effects**. Cresskill, NJ: Hampton Press.

Trumbo, C. 1994. **Inter-media agenda-setting and the issue of global warming: a time series analysis**. Paper presented at the AEJMC Conference on Media and the Environment, Reno, NV.

Ungar, S. 1992. **The rise and relative decline of global warming as a social problem**. The Sociological Quarterly. 33(4): 483-501.

Weber, R. 1985. **Basic content analysis**. Beverly Hills, CA: Sage.

Weitzman, E.; Miles, M. 1995. **Computer programs for qualitative data analysis**. Thousand Oaks, CA: Sage.

Monitoring the Social Environment for Forest Policy Using the InfoTrend Computer Content Analysis Method

David N. Bengston and David P. Fan[1]

Abstract.—Communications researchers have found that the news media both shape and reflect the views of the public for many social issues. The InfoTrend computer content analysis method was used to analyze the views expressed in a large database of news stories about the USDA Forest Service and national forests. The goal was to develop a system for monitoring the social environment for forest policy for selected issues. This approach to social monitoring holds great promise as a tool for managers and policymakers in the information age.

The job of policymakers is growing increasingly complex because of rapid change in the social environment in which decisions are made. This paper describes a system for monitoring change in the social enviroment for forest management and policy using computer content analysis of online news media stories. Updates of selected trends tracked in this social monitoring system are presented.

The idea of monitoring the social environment through analysis of the news media dates back at least to sociologist Alvan Tenney's (1912) proposal and attempt to systematically survey newspaper content to gauge the "social weather" (see also Woodward 1934, Lasswell 1941). The first large-scale attempt to construct quantitative social indicators based on content analysis of news media text was a pilot study carried out at Stanford's Hoover Institution from 1947 to 1952. The RADIR (Revolution And the Development of International Relations) project traced changes in ideas, attitudes, and values expressed in the elite newspapers of five countries from 1890 to 1950 (Pool *et al.* 1970). Unfortunately, this ambitious project was carried out in the precomputer era and was therefore labor-intensive and expensive. Like Tenney's earlier effort, the RADIR project produced highly generalized findings with low relevance for public policy.

The availability of large amounts of news media text from online commercial databases and the Internet in recent years has made it possible to construct a new type of social information system to inform policy, planning, and management. This paper briefly describes such a system. In the following section, we briefly discuss the rationale for analyzing the news media as a means of obtaining social information. Then we give an example of the application of computer content analysis to monitoring of the social environment for the USDA Forest Service. Key dimensions of the social environment included in this monitoring system are described and related to strategic goals of the Forest Service, and selected results are presented and compared to the findings of surveys. In a concluding section, we discuss the advantages and usefulness of this approach to monitoring the social environment.

RATIONALE FOR CONTENT ANALYSIS OF THE NEWS MEDIA

Analysis of the content of the news media has repeatedly been shown to produce results that parallel the findings of attitude surveys and opinion polls. Most studies have shown that the media play an important role in influencing public attitudes and beliefs about various social issues (e.g., Fan 1988, Fan 1994, Gamson and Modigliani 1989, Hauss 1993, Hoffman 1996, Kennamer 1994, Kepplinger and Roth 1979, Lindenmann 1983, Noelle-Neumann 1991, Parlour and Schatzow 1978, Salwen 1988). Related studies have found that the news media also influence agenda-setting for a wide range of issues, i.e., there is a relationship between the relative emphasis given

[1] *USDA Forest Service, North Central Research Station, 1992 Folwell Ave., St. Paul, MN 55108, E-mail: dbengston@fs.fed.us; Genetics and Cell Biology, University of Minnesota, St. Paul, MN 55108, E-mail: dfan@infotrendinc.com.*

by the media to issues and the degree of salience these topics have for the public. Dearing and Rogers (1996) identified more than 350 published studies on media agenda-setting, the vast majority of which support the agenda-setting hypothesis.

There are two reasons for the influence of the news media on public attitudes and beliefs. First, social issues are debated in a variety of forums in society, including the courts, legislatures, public meetings and hearings, protests and confrontations, and the news media. The media play two important roles in these debates, serving both as a direct forum for public discourse (through editorials and letters to the editor) and reporting on debates occurring in all other forums. Social theorist Jürgen Habermas defined the term "public sphere" as a realm of social life in which citizens can come together as a rational body and discuss and debate issues of public concern, and in which public opinion can be formed. Habermas (1974:49) stated that "Today newspapers and magazines, radio and television are the media of the public sphere." Content analysis of the news media thus allows us to take the pulse of ongoing debates and discussions about social issues, and thereby indirectly measure public attitudes and opinions.

A second reason for the influence of the news media on public attitudes and beliefs is that, for many issues, the news media are the most important or sole source of information for most people. The media have a stronger agenda-setting effect and greater impact on public opinion for "nonobtrusive" issues, i.e., issues that do not obtrude into audience members' lives and that therefore most people learn about mainly through the media. Most natural resource and environmental issues are nonobtrusive, and several studies have shown that the news media are the most important source of information about these issues for most people (e.g., Atwater *et al.* 1985, Fortner *et al.* 1991, Ostman and Parker 1987, Wilson 1995). Shindler *et al.* (1996) found that the most important source of information about Federal forest management for Oregon residents was newspapers, followed by television, radio, magazines/books, friends/relatives, interest groups, and lastly natural resource agencies.

Therefore, since the news media summarize ongoing social discussion about natural resource issues and are the main source of information for the public, analysis of the news media is an efficient way to indirectly measure the public's views related to these issues.

A SOCIAL MONITORING SYSTEM FOR THE USDA FOREST SERVICE

Fan and Bengston (1997) provide a prototype of a system for monitoring the social environment based on computer content analysis of online news media stories. In the 1997 study, the InfoTrend software was used to analyze more than 28,000 online news media stories about the USDA Forest Service and national forests over the period 1992-1996. The goal was to create the first stage of a system for monitoring the social environment in which the Forest Service operates, focusing on several key aspects of the agency's strategic goals and central mission. This paper updates selected trends from the 1997 report through the end of 1998.

Dimensions of the Social Environment Analyzed

Table 1 outlines the main strategic goals of the Forest Service and related concepts that were analyzed and tracked over time in Fan and Bengston (1997). The first strategic goal is conservation leadership. An overall goal of recent Forest Service strategic plans has been "... to make the Forest Service the world's foremost conservation leader for the 21st century," (USDA Forest Service 1994, p. 1). We addressed the following questions related to conservation leadership: Is the Forest Service viewed by the public as a conservation leader? Is this view changing over time? Based on an examination of Forest Service strategic planning documents, we identified three main dimensions of conservation leadership:

- Stewardship and ethics. Good stewardship of the land and high ethical standards and practices are at the heart of conservation leadership in all Forest Service strategic planning documents. We analyzed expressions of positive and negative attitudes toward the Forest Service's stewardship of the national forests and ethical practices.

Table 1.—*USDA Forest Service strategic goals and related concepts analyzed in Fan and Bengston (1997)*

Strategic Goal 1: Provide Conservation Leadership
Three dimensions of conservation leadership:
1. Stewardship and ethics (positive / negative attitudes) 2. Collaborative management (positive / negative attitudes) 3. Science-based management (positive / negative attitudes)
Strategic Goal 2: Provide Multiple Benefits Within the Capabilities of Ecosystems
Four broad categories of benefits and values:
1. Recreational 2. Commodity-related 3. Ecological 4. Moral, spiritual, and aesthetic
Strategic Goal 3: Ensure Sustainable Ecosystems
Two main dimensions:
1. Ecosystem management (positive / negative attitudes) 2. Ecological literacy (three subdimensions)

- Collaborative management. A collaborative or participatory approach to land management—managing in partnership with the public and other stakeholders—is a second theme closely tied to conservation leadership in Forest Service strategic planning documents. We analyzed expressions of positive and negative attitudes toward the Forest Service's use of collaborative management.
- Science-based management. The Forest Service has a long tradition of science-based forest management and conducts the world's largest program of forestry research. We analyzed expressions of positive and negative attitudes toward the Forest Service's use of science-based management on the national forests.

A second strategic goal of the Forest Service is to provide multiple benefits to people within the capabilities of ecosystems (table 1). We focused on the following questions related to this strategic goal: What benefits and values associated with the national forests are people most interested in and concerned about? Is the relative importance of forest benefits and values changing over time? Forest benefits and values were defined broadly as relatively enduring conceptions of what is good or desirable about forests and forest ecosystems. Based on previous research (Bengston and Xu 1996), we examined four broad categories of national forest benefits and values:

- Recreation. Recreational benefits and values reflect the view that the national forests are good because of the diverse recreational opportunities they provide. We analyzed expressions of the personal and social benefits of the full range of recreation activities and resources.
- Commodity. Commodity-related benefits and values reflect the view that forests are good because they provide

products needed by society and other benefits related to commodity production. We analyzed expressions of the benefits of commodity production (e.g., timber, minerals, cattle grazing), jobs and other economic benefits associated with commodity production, concern over loss of jobs and economic benefits, and other language reflecting economic values and goals.

- Ecological. Ecological benefits and values reflect the view that forest ecosystems are good because they provide life-supporting environmental functions and services upon which human well-being depends. We analyzed expressions of a wide range of ecologically oriented benefits, including various ecosystem functions and services, goals related to ecological value and indicators of the achievement of these goals, and expressions of concern about loss of ecological values or damage to ecosystems.
- Moral, spiritual, and aesthetic. Moral, spiritual, and aesthetic benefits and values reflect the view that forests have value that goes beyond the instrumental benefits we receive from them; they have a good of their own. We analyzed expressions of the spiritual value or sacredness of nature, the moral responsibility to pass on a healthy and high quality natural environment to future generations, heritage and cultural values, aesthetic value, and concern about the loss of these values.

Finally, ensuring sustainable ecosystems is a third strategic goal of the Forest Service (table 1). The Forest Service has an extensive program to monitor *ecological* health and sustainability. But a *social* monitoring system can also help us understand and ensure the sustainability of ecosystems. We examined two questions related to this strategic goal. First, what is the public's attitude toward ecosystem management, and is this changing over time? Ecosystem management is a new model for natural resource management that has been adopted by the Forest Service and many other public and private land management organizations as a means to help achieve ecosystem sustainability.[2] A prerequisite for successfully implementing any management model or significant change in operating practices in a public agency is gauging public acceptance of the model. We therefore analyzed expressions of positive and negative attitudes toward ecosystem management to assess public acceptance of this new approach to ensuring ecosystem sustainability.

"Ecological literacy" was another concept we examined related to the strategic goal of ensuring sustainable ecosystems (table 1). Since most people get most of their information about forests and natural resources from the news media, the level of ecological content of news media discussion of forestry issues may be used as an indicator of ecological literacy. The level of ecological content and sophistication in news media stories about the national forests is important because comprehension of basic ecological concepts is vital to the development of a meaningful understanding of many forestry issues. A sufficient level of ecological understanding by the public is likely to be required for successful collaborative management of the national forests. We developed three separate indicators of ecological literacy, ranging from a broad measure of the amount of discussion of general ecological issues to an in-depth measure of the amount of detailed discussion of various ecological concepts such as nutrient cycling and energy flow.[3]

Selected Results and Comparisons with Surveys

This section presents updates of selected national-level results from our analysis of the issues listed in table 1. Results of the analysis of two issues are briefly discussed: (1) attitudes toward the Forest Service's stewardship and ethics, and (2) expressions of the four broad categories of national forest benefits and values. The analysis of attitudes toward ecosystem management was updated in Bengston *et al.* (1999b). Where possible, we compare our results with survey research of similar issues. For details of the computer content analysis method used in this analysis, see Bengston and Fan (1999a) and Bengston *et al.* (1999).

---

[2] *See Grumbine (1994) or Gerlach and Bengston (1994) for descriptions of ecosystem management and its adoption by public land management agencies.*

[3] *In addition to the strategic issues listed in table 1, we also examined the level of conflict over national forest management. See Bengston and Fan (1999b).*

Trends in Attitudes Toward the Forest Service's Stewardship and Ethics

Figure 1 shows the percent of positive and negative attitudes toward the Forest Service's stewardship and ethical practices expressed in our database of national news media stories.[4] Expressions of positive attitudes toward the agency's stewardship and ethics consistently outweighed expressions of negative attitudes. Over the entire 7-year time period, about 60 percent of the coded paragraphs portrayed the Forest Service as a good steward or with positive ethics and about 40 percent as a poor steward or with questionable ethics. A slight upward trend in the proportion of positive attitudes is evident in figure 1, but this trend was not statistically significant.

The overall 60 percent "approval rating" of the Forest Service's stewardship revealed in figure 1 is similar to the results of recent surveys of U.S. residents. For example, in a national survey of the public (Hammond 1994), 50 percent of respondents agreed or strongly agreed with the statement "The federal government is an effective caretaker of the public forests and grasslands"; 26 percent disagreed or strongly disagreed, and 24 percent were neutral or had no opinion. When Hammond's neutral response category is eliminated to make his results more comparable to ours, 66 percent of his respondents were positive about the Federal government as an effective caretaker of public forests and 34 percent were negative. Shindler *et al.* (1996) found that 57 percent of Oregon residents have confidence in the Forest Service's ability to contribute to good forest management decisions, and Steel *et al.* (1998) found similar percentages of confidence in the ability of the Forest Service to "contribute to good forest management decisions" among citizens residing in western Washington, Oregon, and northern California. Bormann (1996) surveyed visitors to the White Mountain (New Hampshire) and Willamette (Oregon) National Forests and residents of areas adjacent to those forests. The following statement was included: "I think National Forests have

[4] *Figure 1 updates the trends presented in Bengston and Fan (1999a) and Fan and Bengston (1997) through the end of 1998.*

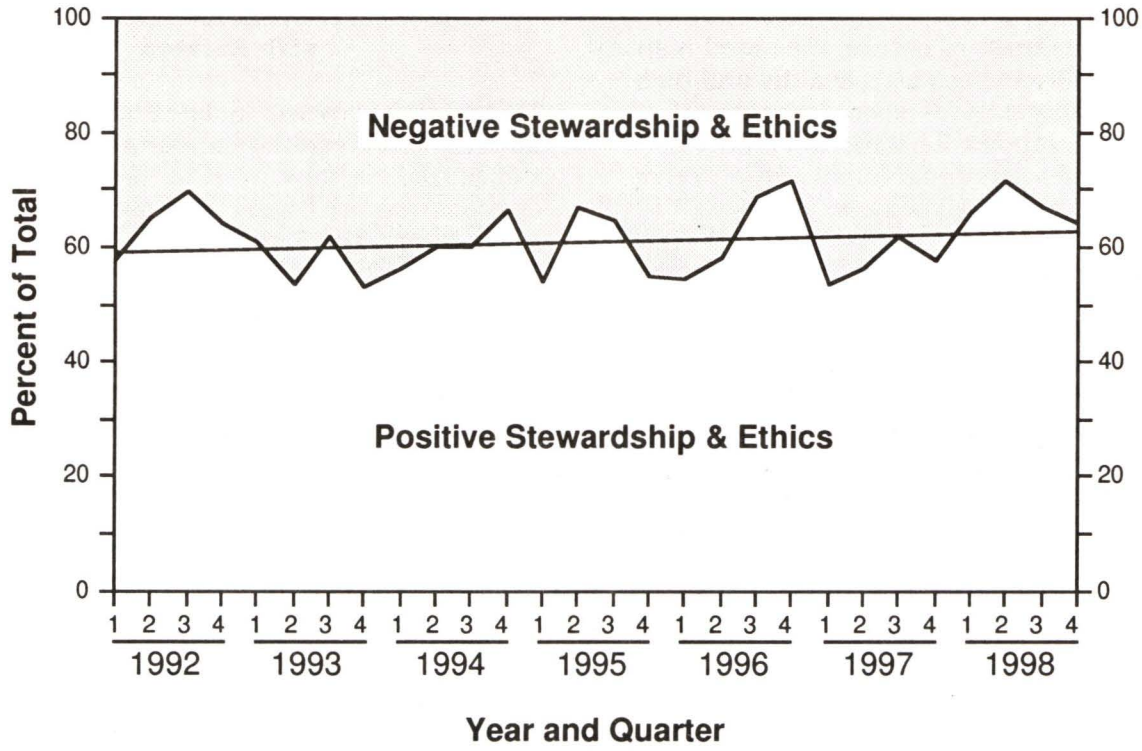


Figure 1.—*Percent of positive and negative attitudes toward the Forest Service's stewardship of the national forests and ethical practices, plotted quarterly 1992-1998.*

been badly managed by the Forest Service" (p. 174). A high percentage of respondents were unsure about the Forest Service's performance (44 percent), but among respondents with an opinion, more than 55 percent disagreed with the statement. Finally, in a national survey conducted for *American Forests* magazine,74 percent of the public was found to have favorable attitudes toward the Forest Service (Smith and Clark 1994). This was a higher favorable rating than environmental groups (64 percent), State forest agencies (47 percent), timber companies (36 percent), or the U.S. Bureau of Land Management (33 percent).

Trends in National Forest Benefits and Values

Figure 2 summarizes the time trends for the four broad categories of benefits and values associated with the national forests.[5] Of the four categories, recreational benefits and values were expressed most frequently over the 7-year period, and were expressed more often than commodity-related benefits and values except in the first half of 1992 and the first half of 1993. Figure 2 reveals a gradual decrease in the relative frequency of expression of commodity-related benefits and values, and a gradual increase in recreation's share. Both of these trends were found to be statistically significant at the 0.01 level.[6] The dominance of recreational benefits and values that we found is consistent with survey results and with recent trends in recreational use of the national forests (USDA Forest Service 1998). For example, in a national survey of the general public, Hammond (1994) found that 62 percent of respondents agreed or strongly agreed (and 22 percent disagreed or strongly disagreed) with the statement "Creating recreation opportunities (boating, hunting, camping, etc.) on public forest lands is important to me." When

[5] *Figure 2 updates the trends presented in Bengston et al. (1999a) and Fan and Bengston (1997) through the end of 1998.*

[6] *A test for trends in proportions based on Kendall's statistic S was carried out for each type of benefit (Brown and Hollander 1977). The null hypothesis of no trend was tested against an increasing trend alternative for recreation and moral/spiritual/aesthetic benefits, a decreasing trend alternative for commodity benefits, and a two-sided alternative for ecological benefits and values.*

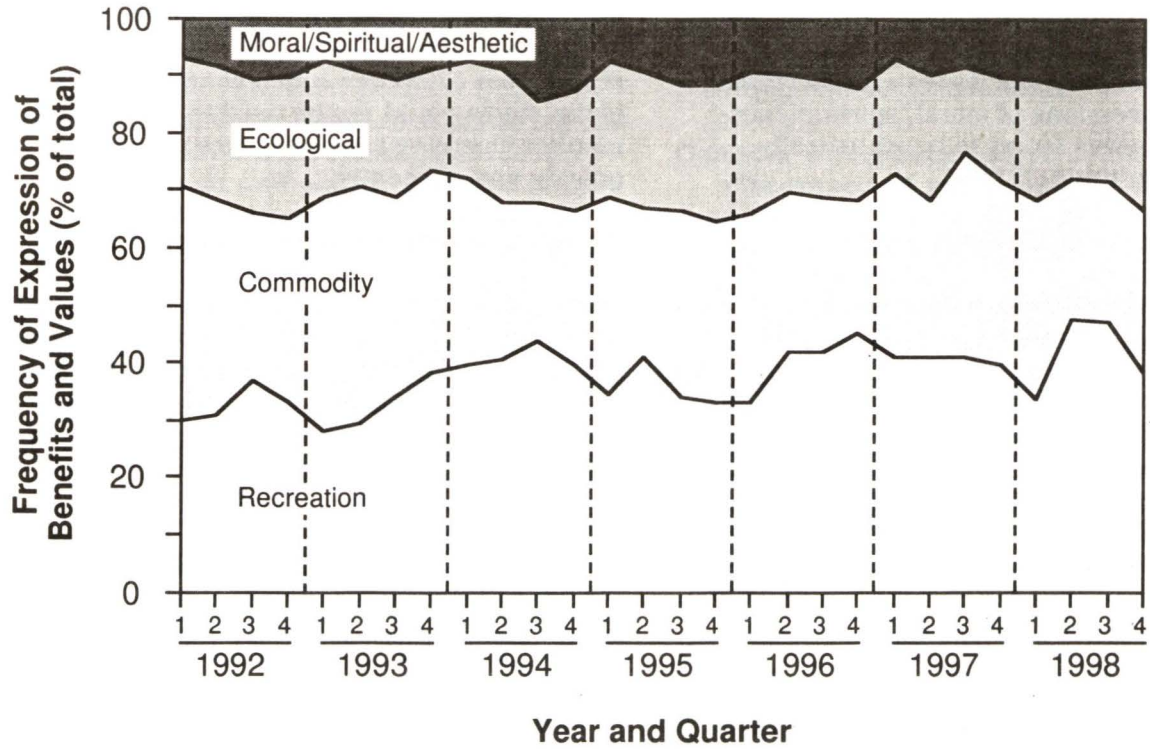

Moral/Spiritual/Aesthetic
Ecological
Commodity
Recreation
Frequency of Expression of Benefits and Values (% of total)
100
80
60
40
20
0
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
1992 1993 1994 1995 1996 1997 1998
Year and Quarter

Figure 2.—*Percent of recreational, commodity-related, ecological, and moral/spiritual/aesthetic benefits and values associated with the national forests, plotted quarterly 1992-1998.*

the same survey asked about commodity benefits and values, however, only 36 percent of the public agreed or strongly agreed (and 46 percent disagreed or strongly disagreed) with the statement "Natural resources in public forests and grasslands should be made available to produce consumer goods."

Expressions of the ecological benefits and values of national forests accounted for about 22 percent of the total over the 7-year period (fig. 2). This level of expression of ecological values—falling just below discussion of commodity-related benefits and values—indicates a relatively high level of concern about the environment and ecosystem protection, and is consistent with survey findings (e.g., Bormann 1996, Manning *et al.* 1999, Steel *et al.* 1994). No statistically significant trend was found for expressions of ecological benefits and values.

Moral/spiritual/aesthetic benefits and values were expressed less often than the other three categories, accounting for about 10 percent of the total on average over time. But given the intangible nature of this category of benefits and values, that percentage may seem surprisingly high. The fact that moral/spiritual/aesthetic values are expressed less often than other categories does not mean they are unimportant. To the contrary, these "deeper" values help explain why people care so passionately about natural resource issues. An increasing trend in expressions of moral/spiritual/aesthetic values was found to be statistically significant at the 0.05 level.

CONCLUDING COMMENTS

Monitoring the social environment using computer content analysis of online news media stories has several important advantages over traditional social science methods. First, an analysis can be extended back in time to establish trends for the concepts of interest. Most social science methods provide decisionmakers with only a snapshot at a particular point in time rather than time trends that reveal the evolution of the public debate about an issue. Time trends provide decisionmakers with information about the rate and direction of change. A second advantage of this approach is that the effects of important events on variables of interest can be observed. For example, the effects of internal events (such as an organization's adoption of a new policy) on attitudes toward the organization can be observed, or the effects of external events (such as an economic recession) on issues of concern to the public can be observed. Third, unlike results produced by traditional social science research methods, the time trends produced in this type of analysis can be updated easily, efficiently, and quickly, making it an ideal monitoring system. Updating an analysis simply requires downloading news media stories from the most recent time period and running it through the computer coding procedure that was originally developed. Time trends could be updated annually, quarterly, weekly, or whatever time frame is of interest to decisionmakers. Fourth, a social monitoring system of this type can be expanded to include additional issues and concepts of interest, or by exploring key issues in greater depth or detail.

Finally, emerging issues can be identified and tracked over time using this approach, making it especially useful to strategic planners. The "ten new directions transforming our lives" discussed in John Naisbitt's (1982) best-selling book *Megatrends* were identified using labor-intensive, human-coded analysis of news media stories. Others have used similar human-coded approaches to identify and track emerging trends (e.g., Merriam and Makower 1988, Celente and Milton 1990). But there is no reason that computer-coded content analysis of the media could not be used to identify and monitor emerging societal issues much more quickly and efficiently.

Rapid change in the social environment in which decisions are made has become the norm. Managing in ways that are responsive to changing social conditions is perhaps the main challenge faced by natural resource managers and policymakers today. Computer content analysis of online textual data provides a new approach for the continuous monitoring and assessment of relevant trends in the social environment. The goal of monitoring the social environment in this manner is to help decisionmakers better understand the context in which decisions and policies need to be made, resulting in better informed decisions that are more responsive to the changing social environment. This approach holds great promise as a tool for decisionmaking and policymaking in the information age.

ACKNOWLEDGMENTS

The authors thank the USDA Forest Service, Office of Communication, Washington, DC, for providing support needed to update the trends discussed in this report.

LITERATURE CITED

Atwater, T.; Salwen, M.B.; Anderson, R.B. 1985. **Media agenda-setting with environmental issues**. Journalism Quarterly. 62: 395-397.

Bengston, D.N.; Fan, D.P. 1999a. **An innovative method for evaluating strategic goals in a public agency: conservation leadership in the U.S. Forest Service**. Evaluation Review. 23(1): 77-100.

Bengston, D.N.; Fan, D.P. 1999b. **Conflict over natural resource management: a social indicator based on analysis of online news media text**. Society and Natural Resources. 12: 493-500.

Bengston, D.N.; Xu, Z. 1996. **Changing national forest values: a content analysis**. Res. Pap. NC-323. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 29 p.

Bengston, D.N.; Fan, D.P.; Celarier, D.N. 1999a. **A new approach to monitoring the social environment for natural resource management and policy: the case of US national forest benefits and values**. Journal of Environmental Management. 56: 181-193.

Bengston, D.N.; Xu, G.; Fan, D.P. 1999b. **Attitudes toward ecosystem management in the United States, 1992-1998**. Draft manuscript. U.S. Department of Agriculture, Forest Service, North Central Research Station, St. Paul, MN.

Bormann, Lincoln H. 1996. **An applied analysis of public values and ecosystem integrity for U.S. national forest management**. Unpublished dissertation. New Haven, CT: Yale University.

Brown, B.W.; Hollander, M. 1977. **Statistics: a biomedical introduction**. New York: John Wiley & Sons. 456 p.

Celente, G.; Milton, T. 1990. **Trend tracking: the system to profit from today's trends**. New York: John Wiley & Sons. 303 p.

Dearing, J.W.; Rogers, E.M. 1996. **Communications concepts 6: agenda-setting**. Thousand Oaks, CA: Sage. 139 p.

Fan, D.P. 1988. **Predictions of public opinion from the mass media: computer content analysis and mathematical modeling**. New York: Greenwood Press. 202 p.

Fan, D.P. 1994. **Predicting public opinion from press coverage**. The Public Perspective (A Roper Center Review of Public Opinion and Polling). 5(5): 21-23. July-August.

Fan, D.P.; Bengston, D.N. 1997. **Public debates shaping forestry's future: an analysis**. Report prepared for the Office of Communication, USDA Forest Service, Washington, DC. (Copies available from the authors, or on the Internet at the following URL: www.ncfes.umn.edu/pubs/media_analysis/contents.html).

Fortner, R.W.; Mayer, V.J.; Brothers, C.C.; Lichtkoppler, F.R. 1991. **Knowledge about the Great Lakes environment: a comparison of publics**. Journal of Great Lakes Research. 17(3): 394-402.

Gamson, W.A.; Modigliani, A. 1989. **Media discourse and public opinion on nuclear power: a constructivist approach**. American Journal of Sociology. 95(1): 1-37.

Gerlach, L.P.; Bengston, D.N. 1994. **If ecosystem management is the solution, what's the problem?** Journal of Forestry. 92(8): 18-21.

Grumbine, R.E. 1994. **What is ecosystem management?** Conservation Biology. 8(1): 27-38.

Habermas, J. 1974. **The public sphere**. New German Critique. 3(Autumn): 49-55.

Hammond, B. 1994. **Forest Service values poll questions: results and analysis**. Report prepared for the USDA Forest Service. Tampa, FL: Kaset International.

Hauss, D. 1993. **Measuring the impact of public relations**. Public Relations Journal. 49(Feb.): 14-21.

Hoffman, A.J. 1996. **Trends in corporate environmentalism: the chemical and petroleum industries, 1960-1993**. Society & Natural Resources. 9(1): 47-64.

Kennamer, J.D., ed. 1994. **Public opinion, the press, and public policy**. Westport, CT: Praeger. 202 p.

Kepplinger, H.; Roth, H. 1979. **Creating a crisis: German mass media and oil supply in 1973-74**. Public Opinion Quarterly. 43: 285-296.

Lasswell, H.D. 1941. **The world attention survey**. Public Opinion Quarterly. 5(3): 456-462.

Lindenmann, W.K. 1983. **Content analysis**. Public Relations Journal. 39(July): 24-26.

Manning, R.; Valliere, W.; Minteer, B. 1999. **Values, ethics, and attitudes toward national forest management: an empirical study**. Society and Natural Resources. 12: 421-436.

Merriam, J.E.; Makower, J. 1988. **Trend tracking: how the media create trends and how to be the first to uncover them**. New York: Tildon Press. 210 p.

Naisbitt, J. 1982. **Megatrends: ten new directions transforming our lives**. New York: Warner Books. 290 p.

Noelle-Neumann, E. 1991. **The theory of public opinion: the concept of the spiral of silence**. In: Anderson, J., ed. Communication Yearbook 14. Newbury Park, CA: Sage: 256-287.

Ostman, R.E.; Parker, J.L. 1987. **A public's environmental information sources and evaluations of mass media**. The Journal of Environmental Education. 18(2): 9-17.

Parlour, J.W.; Schatzow, S. 1978. **The mass media and public concern for environmental problems in Canada 1969-1972**. International Journal of Environmental Studies. 13: 9-17.

Pool, I.; *et al.* 1970. **The prestige press: a comparative study of political symbols**. Cambridge, MA: The M.I.T. Press. 359 p.

Salwen, M.B. 1988. **Effect of accumulation of coverage on issue salience in agenda-setting**. Journalism Quarterly. 65: 100-106.

Shindler, B.; Steel, B.; List, P. 1996. **Public judgment of adaptive management: a response from forest communities**. Journal of Forestry. 94(6): 4-12.

Smith, D.; Clark, L. 1994. **Hot views on hot topics: national survey gauges public views on forests, wildfire, and management**. American Forests. 100(11&12): 3.

Steel, B.; List, P.; Shindler, B. 1994. **Conflicting values about federal forests: a comparison of national and Oregon publics**. Society and Natural Resources. 7: 137-153.

Steel, B.; Shindler, B.; Brunson, M. 1998. **Social acceptability of ecosystem management in the Pacific Northwest**. Chapter in: Soden, Dennis L.; Lamb, Berton Lee; Tennert, John R., eds. Ecosystem management: a social science perspective. Dubuque, IA: Kendall/Hunt Publishers. 212 p.

Tenney, A.A. 1912. **The scientific analysis of the press**. Independent. 73: 895-898.

USDA Forest Service. 1994. **The Forest Service ethics and course to the future**. FS-567. Washington, DC: U.S. Government Printing Office. Oct. 9 p.

USDA Forest Service. 1998. **Report of the Forest Service, fiscal year 1997**. Washington, DC: U.S. Department of Agriculture, Forest Service. 147 p.

Wilson, K.M. 1995. **Mass media as sources of global warming knowledge**. Mass Comm Review. 22(1&2): 75-89.

Woodward, J.L. 1934. **Quantitative newspaper analysis as a technique of opinion research**. Social Forces. 12(4): 526-537.

Computer-Aided Qualitative Content Analysis: A Useful Approach for the Study of Values

Karen G. Mumford and J. Baird Callicott[1]

Abstract.—This paper describes the procedures used to conduct computer-aided qualitative analysis of documents from Great Lakes nongovernmental organizations. Organizational documents were analyzed to identify values expressed toward the Great Lakes. The rationale for this approach is briefly described, followed by presentation of data collection and analysis procedures including: (1) development of a coding strategy following review of a broad sample of organizational documents; (2) purposive selection of key types of Great Lakes organizations; (3) creation of computerized textual databases of a sample of documents from these key organizations; and (4) use of a computer program, QSR NUD•IST, to identify and code the values identified within the documents and to tag, within the actual document, key quotes that can be used to provide further evidence for the types of values identified. The usefulness of computer-aided qualitative data analysis using NUD•IST is presented with examples from the documents analysis.

The Laurentian Great Lakes have undergone significant biophysical and chemical change since European settlement. Nutrient inputs from point and nonpoint sources, modification of stream habitat due to construction of dams and forest clearing, construction of canals and locks, inputs of toxic pollutants, intentional and unintentional introductions of non-native species, and overexploitation of fish stocks have contributed cumulatively to the alteration and degradation of the Great Lakes ecosystem (Francis *et al.* 1979, Ashworth 1986).

Although many studies document the historical and current biophysical and chemical changes occurring in the Great Lakes, few studies identify the social dimensions: specifically, how human values influence use and management of the Great Lakes. Values indicate what is of worth and why. Values expressed or held toward nature, the Great Lakes, and natural resource management influence how the lakes are used and the level of support for strategies or goals carried out by fishery and natural resource managers (Krueger *et al.* 1986).

Understanding values is especially critical given the diversity of governmental and nongovernmental decisionmaking groups involved in management of the Great Lakes. Governmental organizations include management agencies representing two Federal governments, First Nations and Native Americans, eight States, and one Province. Nongovernmental organizations represent sport and commercial fishing interests, tourism, environmental groups, cottage and homeowner groups, and various other constituencies (Eshenroder 1987). These diverse organizations hold similar and competing value orientations and interests. A broad analysis of the values of Great Lakes organizations can reveal differences and sources of conflict between groups as well as similarities and shared concerns. Such information can aid in managing and resolving conflicts.

Despite the influence of values on use and management of the Great Lakes, little is known about the broad range of values held by members of Great Lakes organizations. Most social assessments conducted in the Great Lakes survey the level of participation in and expenditures on fishing or confirm public support for existing fisheries and water resource management programs (Loftus 1987). These surveys do not examine the broader range of held values, which drive use and management of natural areas (Brown 1987). One important exception involves an examination of different

[1] *Department of Environmental Studies, Emory University, 1715 N. Decatur Road, Atlanta, GA 30322. E-mail: kmumfor@emory.edu; Department of Philosophy and Religious Studies, P.O. Box 310920, University of North Texas, Denton, TX 76203. E-mail: callicott@unt.edu*

management philosophies held by Federal, State, Provincial, and Tribal Great Lakes fishery and environmental managers (Knuth *et al.* 1995). Additional research is needed to identify the values held by nongovernmental organizations toward the Great Lakes. In this paper, I present a computer-aided qualitative content analysis approach to examine values expressed in documents from several Great Lakes nongovernmental organizations. The rationale and usefulness of a computer-aided approach is presented along with findings from analysis of organizational documents.

STUDY RATIONALE

Much of social science research rests upon the use of questionnaires and interviews (Webb *et al.* 1981). Analysis of text from documents, such as newsletters and newspapers, is a relatively underused approach for identifying values. Document analysis can be effective for assessing current value orientations because unlike interviews and surveys, the method is unobtrusive. Neither the author nor the audience of the text is aware that the text is being analyzed; hence, measurement will not bias the expression of values (Bengston and Xu 1995). In addition, documents are an excellent medium for analysis because those producing the documents cover the topics and issues most germane to the organization and its members. Therefore, the analysis of documents is "naturalistic" in the sense that values are identified from the actual words used by the organization.

Some studies of environmental values have employed quantitative content analysis of printed material (see, for example, Kellert 1985 and Bengston and Xu 1995). Qualitative analysis is used here because of the exploratory nature of this study. Few studies have examined the values expressed in documents from nongovernmental organizations in the Great Lakes. Qualitative analysis provides an opportunity to capture rich and complex themes and to discover novel or unanticipated values within the broader context of the organization (Miles and Huberman 1994).

Qualitative research usually generates enormous amounts of information, however, making data management, exploration, and synthesis challenging (Cresswell 1998). Fortunately, computer-aided qualitative analysis programs have emerged over the last 15 years and have aided significantly in managing qualitative data (Miles and Huberman 1994). These programs not only aid in management of data but also provide efficient and useful ways to code, search, and explore the data and to construct theories.

In this analysis, the qualitative software program QSR NUD•IST version 4.0 is used to manage and analyze the textual databases containing articles from organizational documents (NUD•IST stands for Nonnumerical Unstructured Data • Indexing, Searching, and Theorizing; Richards and Richards, 1998). NUD•IST helps researchers by providing a system for (1) storing and organizing textual databases; (2) coding of words and phrases within the text; (3) searching and retrieving the text for all instances of a particular coded theme or value, or for retrieving the actual statements that were coded for a particular value; and (4) generating theory by displaying the categories or themes and their interconnectedness (Cresswell 1998). NUD•IST was selected for use in this study because it was recently updated and readily available; the program comes with excellent tutorial and support materials making the program relatively easy to learn; it has been used successfully by numerous researchers; and it has a variety of functions useful for this analysis (cf. Buston 1997).

METHODS

Data for this study included articles from newsletters and newspapers produced monthly or quarterly by several Great Lakes nongovernmental organizations. To select specific organizations for this analysis, a list of Great Lakes organizations was compiled by reviewing directories and web sites, and by contacting staff from various Great Lakes organizations. Six categories of organizations were identified and used in this study: tribal fishing communities, commercial fishing organizations, sport fishing organizations, environmental organizations, waters users (shippers, aquaculturists, municipalities), and naturalist/non-consumptive users groups (kayakers, birding organizations, etc.). Staff of governmental and nongovernmental organizations active in the Great Lakes basin were contacted to obtain their recommendations for specific organizations within the six categories that should be included in this study. Those organizations most frequently mentioned were selected for this

study. Selected organizations were then contacted, and those that were able to provide current and back copies of documents produced between 1995 and 1998 were included in this analysis. Example findings from tribal, sport, and environmental groups will be presented to highlight how computer-aided qualitative data analysis was used in this study.

A coding scheme was developed based on review of a broad sample of documents from Great Lakes organizations. An initial coding strategy manual was produced that describes the values identified and examples of statements from the documents that reflect these values. A values typology was developed and was then presented at organized workshops to members of various governmental and nongovernmental Great Lakes organizations for comments and suggestions. Workshop participants were encouraged to state whether they agreed with the values identified and the way they were characterized and whether any values had been overlooked or misrepresented. After several iterations, a values typology and coding scheme was developed.

Most of the newsletters and newspapers received were in hard copy form (although a few organizations had recent newsletters on the web, which could be down-loaded). Therefore, articles from documents from each organization were randomly selected, and converted into text (as raw textfiles) using a scanner and optical character recognition (OCR) software. Scanned text was reviewed and edited for errors and typos. Hard carriage returns were placed at the end of each line of the articles to indicate the unit of analysis for each article (hard returns can be placed after paragraphs, entire articles, etc., depending on the unit of analysis selected by the researcher). Textual databases composed of articles from organization publications were created.

NUD•IST allows the categories of values developed from the preliminary review of documents to be entered into the computer so they can be quickly referred to and used while reviewing and coding the articles. Generally, coding categories can be input as independent or free nodes or hierarchically with subcategories of values organized under major category headings. For example, under the major value category *anthropocentric* are two subcategories—one representing *material* values and the other representing *non-material* values. Subsequent value subcategories were then placed under the categories *material* and *non-material*. Text introduced into NUD•IST was reviewed in its entirety, and each unit of text was coded and assigned to the appropriate value category or node.

THE USEFULNESS OF NUD•IST AND EXAMPLE FINDINGS

Coding and indexing: The flexibility of the node or coding system of NUD•IST allowed the coding system to be expanded as new themes or values emerged during review and analysis of documents. This flexibility allows continuous exploration and discovery of values, which is key for qualitative analysis, and provides an efficient means to add them to the coding system. Also, for some types of values that were frequently expressed, such as economic, subcategories could be developed. This provided a means to fine tune and increase the resolution of the values typology and to explore, in more depth, implied meanings. This flexibility allowed the economic development value theme to emerge, which was different from other types of economic values. For example, some articles framed economic values in the form of income for fishermen, while other articles expressed economic value in the form of economic development for local Great Lakes communities. Differentiating these forms of economic values improves the sensitivity of the analysis.

Indexing functions allow the database to be indexed by various important characteristics such as organization, organization types, topic of article, and date of article. This allows retrieval and analysis of articles based on these important characteristics. For example, of major concern to tribal, sport, and commercial fishing and environmental groups is the issue of fish contaminant advisories. This indexing system allows articles to be pulled up by topic and organizational group to compare how these groups address the issue and what types of values they express when discussing this issue.

Memos: An important aspect of qualitative research is reflective thinking about the text, the coding scheme, and the relationship between various codes. NUD•IST allows memos about ideas or theories to be attached to the coding scheme or nodes or to particular articles

as these ideas emerge. This "thinking out loud" process allows a range of thoughts to be expressed about the meanings implied in the text and provides a place to suggest followup work to further confirm or disconfirm the idea or theory (e.g., list references to locate or review). Memos can be updated and can provide a helpful log of research activities and ideas. In one memo, the following was recorded:

> We are noting a subtle difference when reviewing articles from Aboriginal communities and sport fishing and environmental groups relating to the notion of "ownership" of nature. Aboriginal peoples represent nature as a "gift given from the creator" whereas sport fishers and environmentalists mention nature as something that is "ours" to take care of. Pursue this distinction more fully—review articles from aboriginal values file.

Text search and retrieval: Because the actual text is brought into NUD•IST, the program keeps track of the themes or values coded and maintains the link between the code and the actual text that was coded. This allows easy access to the actual text. Key quotes relating to a particular theme or value can be located for use in presentation of findings. In addition, because NUD•IST can bring up the actual text coded for different values, the consistency and integrity of the coding process can be reviewed and the coding scheme can be corrected or modified to address any new themes of subcategories of values that emerge during the analysis. Retrieval of the actual text allows the focus to remain on the text and the context of the article instead of on the simple text unit that was coded. The database can be queried to retrieve all the phrases or words coded for a particular value. This allows comparisons of the frequency of expression of particular values between different organizations. In the sample below (table 1), the search and retrieval functions were used to locate and present key quotes and frequency information relating to expression of economic values identified in articles from an aboriginal community, a sportfishing group, and an environmental group.

The example statements—which are representative of other statements by the groups—seem to suggest subtle differences among these groups in the nature of economic values expressed. One interpretation is that the economic values expressed by the sportfishing group seem to justify, with economic figures, the importance of the sportfishery. In contrast, the aboriginal and environmental quotes suggest a focus on community and the importance of the lakes in supporting the lives or livelihoods of communities of people. After reviewing these quotes, we re-evaluated the coding system for economic values and then modified it to incorporate these subcategories or themes.

Table 1.—*Frequency of expression of economic values and example statements from documents from an aboriginal community, sportfishing organization, and environmental organization (documents dated 1995 through 1998)*

Organization or group	Frequency of economic value expressions	Example statements
Aboriginal community	0.33	"The Lakes provide our people with economic opportunities."
Sportfishing organization	0.52	"Sportfishing in Ohio accounted for $722 million in expenditures and generated 24,000 jobs."
Environmental organization	0.31	"If we pull together, the Lake Michigan ecosystem will support the economic needs of all who dwell here."

CONCLUSIONS

Computer-aided qualitative data analysis of documents using QSR NUD•IST provided an invaluable tool for examining value expressions toward the Great Lakes within the documents of Great Lakes nongovernmental organizations. After documents were scanned and converted to computer text files, the NUD•IST program provided useful functions that aided in the storage and management of textfiles, the coding of words and phrases within the text, and the retrieval and analysis of both coded information and the actual text. Critical to this analysis was the ability to return to the actual text that was coded to fine tune coding categories and to reflect on the meaning and broader context of the article. The power of the indexing and searching functions and ability to write memos are just a few of the features that provide avenues for deeper exploration of the data, for tracking research activities, and for managing emerging ideas and themes. Future investigations will involve use of NUD•IST to explore emergent theory based on the linkages between various value categories.

ACKNOWLEDGMENTS

This research was supported and funded by the Great Lakes Fishery Commission, Ann Arbor, MI.

LITERATURE CITED

Ashworth, W. 1986. **The late Great Lakes: an environmental history**. New York: Knopf.

Bengston, D.N.; Xu, Z. 1995. **Changing national forest values: a content analysis**. Res. Pap. NC-323. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station.

Brown, T.L. 1987. **Typology of human dimensions information needed for Great Lakes sport-fisheries management**. Transactions of the American Fisheries Society. 116: 320-324.

Buston, K. 1997. **NUD•IST in action: its use and its usefulness in a study of chronic illness of young people**. Sociological Research Online 2: <http://www.socresonline.org.uk/ socresonline/2/3/6.html>

Cresswell, J.W. 1998. **Qualitative inquiry and research design: choosing among five traditions**. Thousand Oaks, CA: Sage Publications.

Eshenroder, R.L. 1987. **Socioeconomic aspects of lake trout rehabilitation in the Great Lakes**. Transactions of the American Fisheries Society. 116: 309-313.

Francis, G.R.; Magnuson, J.J.; Regier, H.A.; Talhelm, D.T. 1979. **Rehabilitating Great Lakes ecosystems**. Tech. Rep. 37. Ann Arbor, MI: Great Lakes Fishery Commission.

Kellert, S.R. 1985. **Historical trends in perceptions and uses of animals in 20th century America**. Environmental Review. 9(1): 19-31.

Knuth, B.A.; Lerner, S.; Connelly, N.A.; Gigliotti, L. 1995. **Fishery and environmental managers' attitudes about and support for lake trout rehabilitation in the Great Lakes**. Journal of Great Lakes Research. 21 (Supplement 1): 185-197.

Krueger, C.; Decker, D.; Gavin, T. 1986. **A concept of natural resource management: an application to unicorns**. Transaction NE Section of the Wildlife Society. 43: 50-56.

Loftus, K.H. 1987. **Inadequate science transfer: an issue basic to effective fisheries management**. Transactions of the American Fisheries Society. 116: 314-319.

Miles, M.B.; Huberman, A.M. 1994. **Qualitative data analysis: an expanded sourcebook**. 2d ed. Thousand Oaks, CA: Sage Publications.

Richards, T.J.; Richards, L. 1998. **Using computers in qualitative research**. In: Denzin, N.; Lincoln, Y., eds. Collecting and interpreting qualitative materials. Thousand Oaks, CA: Sage Publications: 211-245.

Webb, E.J.; Campbell, D.T.; Schwartz, R.D.; Sechrest, L.; Grove, J.B. 1981. **Nonreactive measures in the social sciences**. Boston, MA: Houghton and Mifflin Co.

In Search of Common Ground Among Diverse Forest Stakeholders: A Contextual Content Analysis of Online Text

Jennifer A. Cuff, David N. Bengston, and Donald G. McTavish[1]

Abstract.—Managing public forests collaboratively requires an understanding of differences between and similarities among diverse stakeholder groups. The Minnesota Contextual Content Analysis (MCCA) computer program was used to analyze text obtained from World Wide Web sites expressing the views of seven diverse stakeholder groups involved in forest planning and management. Stakeholder groups were found to share a practical orientation toward achievement of goals, but had important differences in the emphasis they placed on a set of more specific concepts. MCCA was found to be a potentially useful tool for stakeholder analysis.

A stakeholder is defined as a person or social group who feels that their interests will be affected by the outcome of a decisionmaking process (Dunster and Dunster 1996). These interests may be financial or economic, but they may also be motivated by the full range of human values, including moral, spiritual, aesthetic, and ecological values. The number and diversity of forest stakeholder groups—and their importance in forest planning and management—have increased in recent decades.

Understanding the ways in which stakeholder groups view forest policy and management is likely to be a key to successful collaborative planning. Members of different stakeholder groups often have widely divergent perspectives on forest management. There may, however, also be significant similarities in the ways in which stakeholders view forest management which may be common ground for collaborative and participatory approaches to forest management. Managing public forests collaboratively requires an understanding of both differences between and similarities among diverse stakeholder groups.

This study used the Minnesota Contextual Content Analysis (MCCA) computer program to analyze differences and similarities between seven stakeholder groups involved in forest planning and management. In the following section, we describe the data and computer content analysis methodology. This is followed by a discussion of the findings. In the final section, we briefly discuss implications for collaborative approaches to forest planning.

DATA AND METHODOLOGY

The textual data analyzed in this study were obtained during the spring of 1997 from the web sites of forestry stakeholders. We searched web sites of the following seven stakeholder categories for text related to forest or other natural resource policy and management, including position papers, press releases, newsletter articles, speeches, and so on:

- Native Americans (Menominee Tribal Enterprises, Indian Forest Management Team)
- Mainstream environmentalists (Sierra Club, Audubon Society)
- Radical environmentalists (Earth First!)
- Wise use group (Center for the Defense of Free Enterprise)
- Timber industry associations (American Forest & Paper Association, Engineered Wood Association)
- Forestry professionals (Society of American Foresters)
- USDA Forest Service

An important motivation for groups such as these to create web sites is to promote their views about various policy issues. Many of the documents we found on these web sites were an outstanding source of expressions of the

[1] *412 S. State Street, Waupaca, WI 54981 E-mail: jencuff@hotmail.com; USDA Forest Service, North Central Research Station, 1992 Folwell Ave., St. Paul, MN 55108 E-mail: dbengston@fs.fed.us; 1764 Wildwood Road, Duluth, MN 55804 E-mail: dmctavis@d.umn.edu.*

attitudes, beliefs, values, and worldviews of the seven forestry stakeholder groups.

After identifying and downloading stakeholder texts from the Internet, we analyzed the texts using the MCCA program (McTavish and Pirro 1990). MCCA is a computer-based content analysis program that has been used in the analysis of a wide range of social science research questions (e.g., see Garwick *et al.* 1994, McTavish 1997, McTavish *et al.* 1997, and papers located at http://www.clres.com). MCCA builds in certain rules for text analysis that helps users compare a large number of complex texts. To do this, a dictionary is used to organize words into over 100 idea categories and each category is characterized by four weights reflecting the way categories are emphasized in four general social/institutional contexts. Many words with multiple meanings are disambiguated using the context information about categories.

MCCA calculates two normed score profiles for each text segment: institutional or social context scores (c-scores) and concept emphasis scores (e-scores). These are normed against standard English usage found in a broad sampling of written and spoken text. Both scores are useful as part of a systematic analysis of textual data, and they help in an examination of similarities and differences between stakeholder groups.

C-scores: A profile of four social context scores indicates the relative emphasis or lack of emphasis on four general social contexts. The profiles help identify how ideas in a text are framed. In this study, c-scores represent the institutional or social perspective forest stakeholders use in framing their discussions. The four c-scores are identified as follows:

- *Traditional.* This approach emphasizes normative standards of conduct, rules, and sanctions for deviation that are framed as right or wrong. Institutions in which standards guiding social behavior are emphasized include religious, military, and legal institutions. Text generated in these situations would typically receive high positive c-scores indicating their framing in a normative or traditional way.
- *Practical.* This approach is goal or achievement oriented. Deviations are treated as a success or failure in accomplishment. Business institutions emphasizing the "bottom line" would typically be examples of this way of framing a text. A pragmatic approach to topics would typically receive a high positive c-score on this dimension.
- *Emotional.* This approach emphasizes personal involvement or concern, stronger likes or dislikes, comfort or irritation, engagement or repulsion in the topics being addressed. Leisure institutions tend to emphasize this way of framing ideas and, thus, the approach would receive higher positive c-scores.
- *Analytic.* This approach emphasizes a more distanced or intellectual curiosity about some phenomenon as might be found in educational and research institutions.

E-scores. These scores measure the overemphasis or underemphasis a text places on each of more than 100 idea categories. The following examples are a few of the idea categories and words that may be coded for these categories, depending on the context in which they are used:

- *Virtues* (e.g., benefits, courage, healthy, justice, priority, reputation, valuable, vigilance, virtue)
- *Deviance* (e.g., bribe, bribery, collusion, crimes, deviation, fraud, greedy, lie, murderers, pretenses, propaganda, rumors, theft, vice)
- *Duty* (e.g., commitment, duty, necessity, obligation, registration)
- *Traditional Symbols* (e.g., children, compliance, disadvantage, privilege, regulations, respect, respected, status)
- *Merchandise* (e.g., capital, cattle, crops, economies, economy, expenses, lumber, minerals, oil, products, property, resource, salaries, timber, wealth)
- *Activity* (e.g., activity, energy, meeting, occupied, organizing, programs, reporting)
- *Prohibit* (e.g., abandoned, abolish, barring, excluded, exclusion, forbid, ignored, limiting, limits, prevent, restricted)
- *Submit* (e.g., accept, admitted, conforming, following, obey, organizing, reliance, respect, sacrificing, serve, submit, worship, yielding)
- *Deviant Behavior* (e.g., abuse, attacks, degenerate, fighting, killing, lied, lynch, rob, smuggling, waste, wrong, wrongful)

- *About Changing* (e.g., approaching, attempt, attempting, challenging, conversion, exert, management, renewing, restoring, strives, tried)
- *Creative Process* (e.g., caused, created, creating, creative, devise, discovered, establishing, formulate, generate, imagine, inspired, original)

E-scores range from high negative scores to high positive scores, with zero normed at usual English usage of a broad sample of text. Higher positive scores indicate greater emphasis on that idea in the text, and higher negative scores indicate a censoring or omission of that idea. Sets of related categories can be grouped to examine broader concepts and themes in a text (e.g., categories such as good, virtues, enjoy-like, and happy could be grouped together as a broader positive concept). Quantitative distinctions between texts can be made by calculating an overall distance between profiles of emphasis on idea categories.

FINDINGS

Table 1 provides the profile of social context scores for each of the seven stakeholder groups. The scores are weighted so that they sum to zero within groups. In general, the seven groups frame their presentation of themselves and their perspectives on forest management issues in a practical manner, with all of the practical scores the highest scores for any text. They also avoid an emotional framing of their presentation, or the sense that they are highly involved personally in their position. Instead, the picture they present is one of handling a practical matter.

Beyond the overall practical emphasis, stakeholders present a somewhat different pattern in the framing of their position. Each profile of c-scores shows somewhat different emphases. To analyze these differences, we computed Euclidean distances between c-score profiles of all pairs of stakeholders. These distances are shown in table 2 and portrayed in a two-dimensional plot in figure 1. This plot is the result of a non-metric scaling analysis that iteratively fits plot positions in a way that maintains the relative distances shown in the distance matrix shown in table 2. Figure 1, then, shows how close the seven stakeholders are in the way they frame their views of forestry issues. For example, some groups take a somewhat more normative or traditional approach (e.g., Wise Use Group and the USDA Forest Service). Some couch themselves in a somewhat more distanced analytic way (e.g., Forestry Professionals and the Wise Use Group).

The Wise Use Group, Forestry Professionals and Radical Environmentalists are most distant from each other and they bound the cluster plot (fig. 1). This suggests that these groups would have difficulty understanding each other and, perhaps, communicating with each other unless they moved somewhat closer to each other in the way they frame their discussion. Forestry Professionals and the Wise Use Group are least pragmatic and more analytic than the other stakeholders, suggesting that they are more likely to take on a somewhat academic stance. Radical Environmentalist groups, on the other hand, are lowest on the analytic dimension and, with Native Americans, Mainstream Environmentalists,

Table 1.—*Weighted social context scores (c-scores) for seven forest stakeholder groups (scores sum to zero within groups). Positive numbers indicate overemphasis, and negative numbers indicate underemphasis.*

Forest stakeholders	Social perspective			
	Traditional	Practical	Emotional	Analytic
Native Americans	-5.53	25.00	-18.64	-0.83
Mainstream environmentalists	-0.93	24.44	-24.07	0.56
Radical environmentalists	-2.49	25.00	-14.51	-8.00
Wise use group	5.57	14.93	-25.00	4.50
Timber industry associations	-2.19	25.00	-21.90	-0.91
Forestry professionals	-5.63	18.91	-19.37	6.09
USDA Forest Service	2.40	22.60	-24.06	-0.94

Table 2.—*Matrix of Euclidian distances between groups based on the four social contexts (c-scores). Smaller numbers indicate greater similarity between groups, and larger numbers indicate less similarity.*

Forest stakeholders	Forest stakeholders*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Native Americans	.0	7.3	8.8	17.1	4.7	9.2	9.9
(2) Mainstream environmentalists	7.3	.0	12.9	12.2	3.0	10.3	4.1
(3) Radical environmentalists	8.8	12.9	.0	20.8	10.2	16.4	13.1
(4) Wise use group	17.1	12.2	20.8	.0	14.2	13.2	10.0
(5) Timber industry associations	4.7	3.0	10.2	14.2	.0	10.2	5.6
(6) Forestry professionals	9.2	10.3	16.4	13.2	10.2	.0	12.2
(7) USDA Forest Service	9.9	4.1	13.1	10.0	5.6	12.2	.0

* 1 = Native Americans, 2 = Mainstream environmentalists, 3 = Radical environmentalists, 4 = Wise use group, 5 = Timber industry associations, 6 = Forestry professionals, 7 = USDA Forest Service.

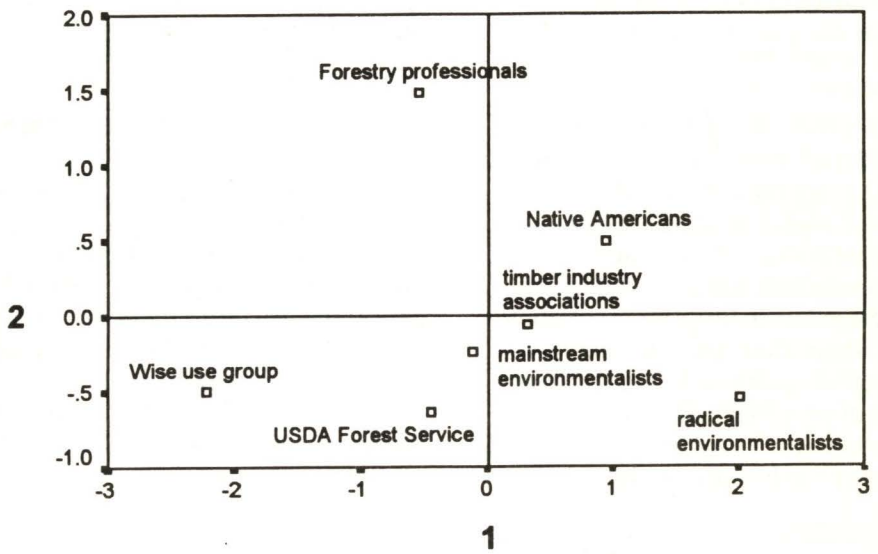


Figure 1.—*Plot of context distances (c-scores) between stakeholder texts.*[2]

and Timber Industry Associations, express themselves in a very pragmatic, drive-to-success oriented way. The Wise Use Group and the USDA Forest Service tend to frame their presentations in more traditional terms than the other groups, stressing rules of appropriate behavior and how things should be. Although all groups tend to frame their position in non-emotional terms, the Native American and Radical Environmental groups are somewhat less "un-emotional" in framing their presentations.

Groups that are apparently closest in their framing are Timber Industry Associations and Mainstream Environmentalists, and we would predict that this indicates they may be better able to discuss issues than are groups more distant in social context. The similarity in c-score profiles for these Timber Industry Associations and Mainstream Environmentalists

[2] *This two-dimensional plot of the c-score distance matrix shows the Euclidean distance between c-score profiles for the seven text groups. The distance matrix was analyzed using non-metric scaling with the SPSS program Alscal. The plot shows relative distances between texts in terms of how they frame their discussion. Smaller distances mean that the groups are framing their discussion in more similar ways.*

may indicate that although these groups often have different policy goals related to forestry issues, they are both mainstream in their perspectives and strategies and are attempting to appeal to a broad audience with their views of forest policy.

As shown in figure 1, the USDA Forest Service, Mainstream Environmentalists, Timber Industry Associations, and Native Americans are relatively close to each other, differing mainly in how tradition oriented they are (USDA Forest Service being more tradition oriented and Native Americans the least). The Wise Use Group and Radical Environmentalists are most distant, contextually. Radical Environmentalists are also far from Forestry Professionals. The relatively substantial distance in how the USDA Forest Service and Forestry Professionals frame their presentations of forestry issues suggests some potential for communication problems.

Table 3 provides a probability distance matrix between stakeholders based on their overall profile of over 100 e-scores. Figure 2 is a two-dimensional cluster plot that graphically illustrates these distances. It is clear that Radical Environmentalists and the Wise Use Group are most different from other stakeholders, emphasizing ideas that are relatively different from ideas emphasized by the other groups. In terms of emphasized ideas, the USDA Forest Service and Forestry Professionals are relatively similar (although, as figure 1 reveals, they differ in how these ideas are framed). Mainstream Environmentalists and Native Americans are relatively close in the ideas they discuss in their web presentations.

Table 4 provides a listing of some of the main e-score differences between these groups. There are several noteworthy patterns. For example, the Wise Use Group emphasizes the idea of "prohibit" much more than others do and it emphasizes talk of "deviant behavior." It also tends to emphasize ideas of "creative processes" as do the Forestry Professionals and, to a lesser extent, Mainstream Environmentalist stakeholder groups. All groups except the Wise Use Group and Radical Environmentalists emphasize the concept category "about changing." The Timber Industry Associations emphasize the idea of "merchandise" more than other groups, but Native Americans and Mainstream Environmentalists emphasize this idea as well.

CONCLUDING REMARKS

Is there common ground between these diverse stakeholder groups? This analysis suggests that the social orientation of the seven forestry stakeholder groups is somewhat similar. Forest policy and management is a practical activity, and all of the groups share a pragmatic orientation toward achievement of goals. The success of some collaborative forest management efforts in recent years is evidence that stakeholders can work together to achieve

Table 3.—*Matrix of Euclidian distances between groups based on the concept emphasis scores (e-scores). Smaller numbers indicate greater similarity between groups, and larger numbers indicate less similarity.*

	Forest stakeholders*						
Forest stakeholders	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
(1) Native Americans	.0	23.3	34.8	34.2	28.3	26.7	29.9
(2) Mainstream environmentalists	23.3	.0	35.2	35.5	24.8	30.2	27.7
(3) Radical environmentalists	34.8	35.2	.0	31.2	42.1	44.9	40.7
(4) Wise use group	34.2	35.5	31.2	.0	42.8	40.4	33.7
(5) Timber industry associations	28.3	24.8	42.1	42.8	.0	34.1	35.1
(6) Forestry professionals	26.7	30.2	44.9	40.4	34.1	.0	32.1
(7) USDA Forest Service	29.9	27.7	40.7	33.7	35.1	32.1	.0

* 1 = Native Americans, 2 = Mainstream environmentalists, 3 = Radical environmentalists, 4 = Wise use group, 5 = Timber industry associations, 6 = Forestry professionals, 7 = USDA Forest Service.

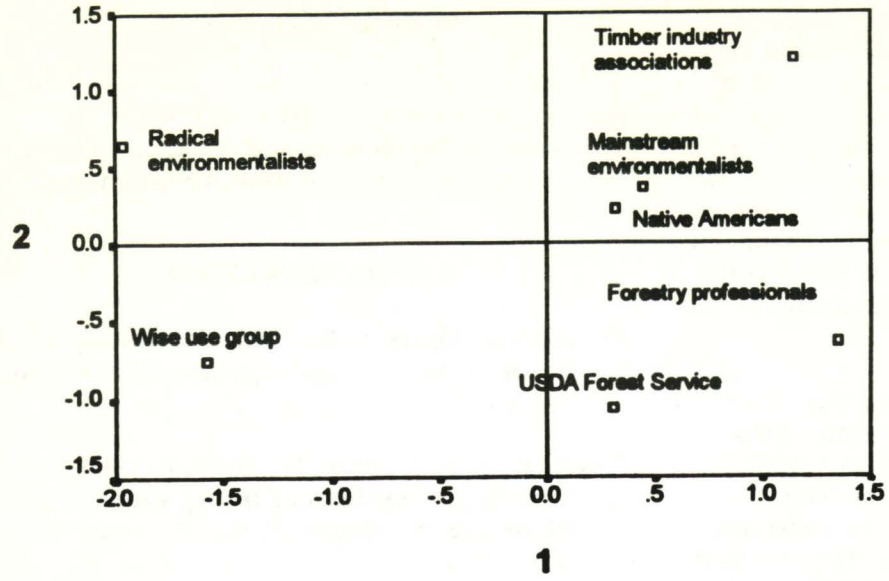


Figure 2.—*Plot of concept distances (e-scores) between stakeholder texts.*[3]

common goals, and the similarity in social context shown in table 1 may be a factor in this success.

But this analysis also shows that, as would be expected, significant differences exist between forestry stakeholders, especially in terms of the ideas they emphasize. Differences in values, attitudes, and goals may be inferred from many of the 116 concept categories identified by MCCA. For example, the Native American text emphasized the idea "submit" far more than the other stakeholder texts. A closer examination of the Native American text reveals that this emphasis reflects a greater concern with

[3] *This two-dimensional plot of the e-score distance matrix shows the difference between e-score profiles for the seven text groups. The distance matrix was analyzed using non-metric scaling with the SPSS program Alscal. The plot shows relative distances between texts in terms of what they are emphasizing. Smaller distances mean that the groups are emphasizing more similar ideas.*

Table 4.—*Concept emphasis scores (e-scores) for seven forest stakeholder groups for selected concept categories. Positive numbers indicate overemphasis, and negative numbers indicate underemphasis.*

Selected concept categories	Forest stakeholders*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
About changing	24.65	20.15	3.41	5.16	20.01	30.59	26.59
Creative process	9.88	10.66	3.91	11.55	6.72	27.28	5.86
Submit	8.25	4.60	-2.07	-0.89	-0.38	-0.55	3.51
Merchandise	4.60	4.51	0.80	0.90	5.43	2.98	3.08
Prohibit	4.18	5.53	-0.23	17.30	5.63	5.04	-0.04
Duty	1.86	0.80	-1.01	1.50	0.31	7.55	0.69
Activity	1.75	0.97	3.61	8.86	8.66	0.68	0.09
Virtues	1.15	4.04	-0.43	8.12	3.13	4.91	4.39
Deviance	0.57	-1.39	5.58	1.03	-1.43	-2.61	-2.19
Deviant behavior	-1.59	1.09	5.41	7.71	-0.35	-1.87	-0.64
Traditional symbols	-2.64	-2.75	-3.28	-1.09	0.83	4.86	-0.56

* 1 = Native Americans, 2 = Mainstream environmentalists, 3 = Radical environmentalists, 4 = Wise use group, 5 = Timber industry associations, 6 = Forestry professionals, 7 = USDA Forest Service.

respecting the natural world (indicating a higher ranking of moral/spiritual values) and managing forests in ways that conform with natural processes (indicating a higher ranking of ecological values). Timber Industry Association text emphasized "merchandise" more than the other groups, indicating a higher ranking of economic and commodity values. Working out value differences such as these is perhaps the most daunting challenge of collaborative forest planning and management.

Based on this study, we conclude that Minnesota Contextual Content Analysis may be a useful tool for stakeholder analysis. MCCA could be used in the early stages of collaborative planning efforts to analyze text reflecting the views of stakeholder groups. The fact that such text is widely available on the World Wide Web helps ensure that a stakeholder analysis can be carried out quickly and efficiently. MCCA may be especially useful if text obtained from open-ended surveys or interview transcripts of the general public is included for comparison with the other groups. The perspective of the general public on forestry issues could serve as a benchmark for comparison. Similarities in social context or concepts that are emphasized may be a useful starting point in identifying common ground between diverse groups. Similarities and differences between groups identified in a stakeholder analysis of this type may be helpful in designing more effective collaborative planning processes.

ACKNOWLEDGMENTS

The authors thank the Undergraduate Research Opportunity Program (UROP) at the University of Minnesota, and the USDA Forest Service, North Central Research Station, for support.

LITERATURE CITED

Dunster, J.; Dunster, K. 1996. **Dictionary of natural resource management**. Vancouver, BC: UBC Press. 363 p.

Garwick, A.W.; Detzner, D.; Boss, P. 1994. **Family perceptions of living with Alzheimer's disease**. Family Process. 33: 327-340.

McTavish, D.G. 1997. **Scale validity: a computer content analysis approach**. Social Science Computer Review. 15(4): 379-393.

McTavish, D.G.; Litkowski, K.C.; Schrader, S. 1997. **A computer content analysis approach to measuring social distance in residential organizations for older people**. Social Science Computer Review. 15(2): 170-180.

McTavish, D.G.; Pirro, E.B. 1990. **Contextual content analysis**. Quality and Quantity. 24: 245-265.

Printed on recyclable paper.

☆U.S. GOVERNMENT PRINTING OFFICE: 2000 556-891/00036

Bengston, David N.
2000. **Applications of computer-aided text analysis in natural resources**. Gen. Tech. Rep. NC-211. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 54 p.

Ten contributed papers describe the use of a variety of approaches to computer-aided text analysis and their application to a wide range of research questions related to natural resources and the environment. Taken together, these papers paint a picture of a growing and vital area of research on the human dimensions of natural resource management.

KEY WORDS: Computer-aided, computer-coded, content analysis, human dimensions, text analysis, textual data.